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Published by The American Radio Relay League

SEPTEMBER
1924

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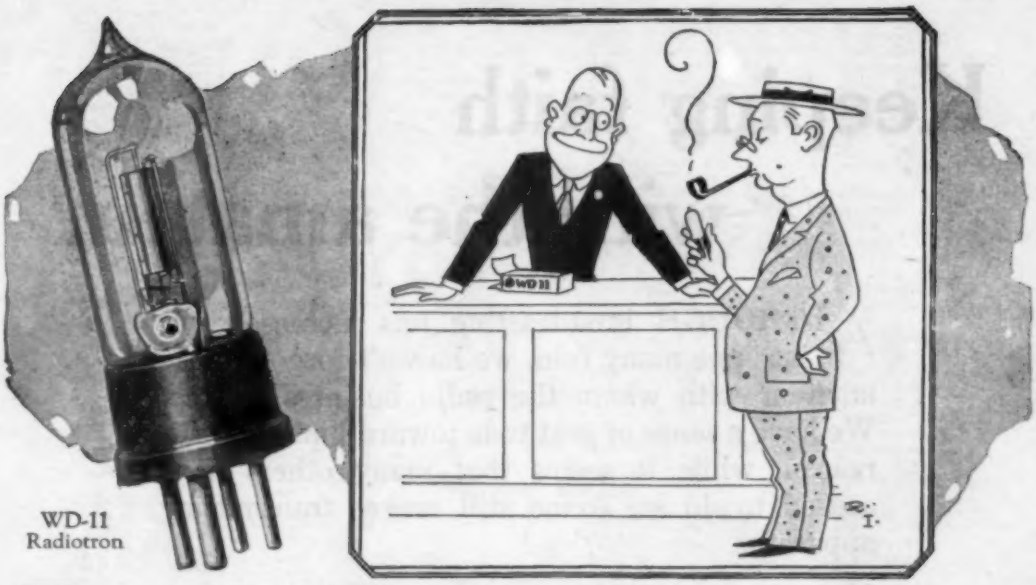

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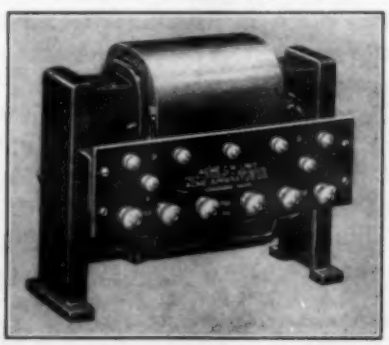

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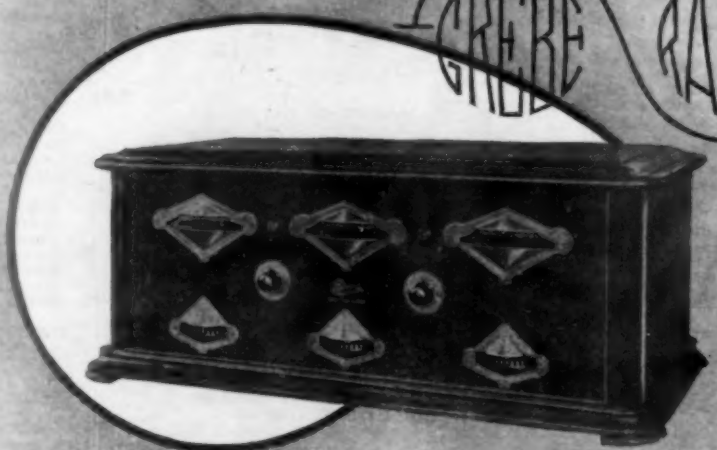

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QST

The Official Organ of the A.R.R.L.

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THE AMERICAN RADIO RELAY LEAGUE, Inc.
HARTFORD, CONN.

THE AMERICAN RADIO RELAY LEAGUE

The American Radio Relay League, Inc., is a national non-commercial association of radio amateurs, bonded for the more effective relaying of friendly messages between their stations, for legislative protection, for orderly operating, and for the practical improvement of short-wave two-way radio telegraphic communication.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is non-commercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its Board.

"Of, by and for the amateur," it numbers within its ranks practically every worth-while amateur in America and has a history of glorious achievement as the standard bearer in amateur affairs.

Inquiries regarding membership are solicited. Ownership of a transmitting station, while very desirable, is not a prerequisite to membership; a bona-fide interest in amateur radio is the only essential. Correspondence should be addressed to the Secretary.

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EDITORIALS
de AMERICAN RADIO RELAY LEAGUE

The New Short Waves

EUREKA! The short waves at last! After about a year's hard work, Amateur Radio thru the efforts of the A. R. R. L. has been given the use of five bands of short waves. No better news could be received in the game at this time. The following from the "Bunav" tells the story:

DEPARTMENT OF COMMERCE
BUREAU OF NAVIGATION
WASHINGTON

July 25, 1924.

Mr. K. B. Warner, Sec.,
The American Radio Relay League,
Hartford, Conn.

Sir:

There is enclosed herewith for the information of the American Radio Relay League copy of the new regulations affecting the operation of amateur transmitting radio stations.

A copy of these regulations has been sent to each Supervisor of Radio. Because of the work involved it is not possible to notify each amateur individually. Therefore it is suggested that you give the new regulations publicity thru your magazine and also as a telegraph broadcast thru the amateur stations if you consider this advisable. It will be given to the press at Washington for release Monday.

It is hoped that sufficient experimentation can be carried on on the short wave lengths by amateurs before the next conference is held in the latter part of September to accumulate some dependable data which will be helpful in connection with considering amateur wave lengths at the conference, where there will undoubtedly be made requests for the use of short wave lengths for commercial purposes which may result in some change in the allocation authorized in the new regulations.

Respectfully,
D. B. Carson, Commissioner

The Text of the New Regs

DEPARTMENT OF COMMERCE
BUREAU OF NAVIGATION
WASHINGTON

July 24, 1924.

All Supervisors of Radio.

Sirs:

Effective this date you are authorized to issue general and restricted amateur radio station licenses to permit the use of any one or all of the following bands of short wave lengths:—75 to 80 meters, 40 to 43 meters, 20 to 22 meters, 4 to 5 meters, in addition to the band 150 to 200 meters, provided application is made by the owner of the station, which station must be prepared to use the wave length, or wave lengths, requested.

The use of continuous wave telegraphy only will be permitted on wave lengths other than 150 to 200 meters and the antenna circuit must not be directly coupled to the transmitting circuit.

Silent hours will not be required of amateurs while using the wave lengths within the above bands below 80 meters except where the transmitting station is so situated as to produce objectionable interference with other services.

Hereafter special amateur stations will not use wave lengths above 200 meters. They may be authorized to use the band of wave lengths from 105 to 110 meters in addition to the wave lengths within the bands authorized for general and restricted amateur use, where the special amateurs are engaged in conducting tests with government or commercial stations.

General, restricted and special amateur stations will be permitted to use the entire band of wave lengths from 150 to 200 meters employing pure C.W., spark and modulated forms of transmission.

It should be made clear to the amateurs that the authority granted above is necessarily tentative because of the rapid development taking place in radio communication and the bands of wave lengths authorized may be changed whenever in the opinion of the Secretary of Commerce such change is necessary.

Respectfully,
D. B. Carson, Commissioner

Approved:
J. Walter Drake,
Asst. Secy. of Commerce.

Now we can get somewhere! Coming right at the fall rebuilding period, this is just the bracer we have been needing. There are several things that need to be said about the new regulations, so let us take them up paragraph by paragraph.

First Paragraph

We had rather expected that the new regulations would simply announce that hereafter any amateur could use the short waves without more ado, but that was found impossible because it would violate the terms of the licenses now existing, which prescribe the waves that may be used. It is therefore necessary to secure blanks from your Supervisor and fill out a new application, returning your old license therewith. Your old call will be reassigned. Great care must be used to stay within the authorized bands. See the dope in this issue about short-wave wavemeters; several makes are also to be found advertised in our columns. We will have to employ a full measure of teamwork on the air now, and give each other readings and calibrations, until we get broken in on the new game.

Second Paragraph.

This paragraph is to be interpreted as prohibiting the use on the short waves of spark, phone ,and those outright forms of I. C. W. obtained by mechanically interrupting a radio-frequency circuit such as by the use of a chopper or buzzer, but as authorizing all other forms of tube telegraphy, including A. C. plate supply, rectified but unfiltered, self-rectified, and partially filtered, as well as generators and batteries. This was specifically determined at one of our conferences with the Bureau. The chief possibility of our interfering with listeners is not from the

modulation of impure plate supplies but from the keying thump, and it is so vastly simpler to overcome the latter when A. C. is used, as compared with pure D. C., that no attempt has been made to confine the privileges to stations having D. C. supply. The use of coupled circuits is counted on to eliminate interference from the impact of keying, from harmonics, and from supply modulation. It is essential that conductive coupling between antenna system and transmitter be eliminated—that is the basis on which the quiet hours are being lifted on these waves. Either inductive or capacitive coupling may be used. We ought to do this anyhow—the efficiency is higher and the tubes run cooler.

Third Paragraph

This is the *creme de la creme* of the new regulations—no quiet hours will be required of us except in the individual cases where a station cannot be so adjusted as to avoid objectionable interference. "Other services" of course means the B. C. L. There is such a vast difference in frequency between these short waves and the broadcast waves, and there has been so much improvement in B. C. L. sets, that it is felt that with the use of loosely-coupled circuits in the transmitter no interference will result with listeners-in.

Fourth Paragraph

Here was a disappointment to us. We received the short waves largely because we were willing to give up the waves above 200 meters, which are useful to other services, but it was expected that the new band of 105 to 110 meters would be substituted outright therefor. Instead, its use is confined to Z-stations conducting tests with government or commercial stations. Special-license amateurs and others who can meet the requirements of that grade can obtain the use of this band by showing that they want to engage in communication tests with the U. S. Naval Research Laboratory, the Italian government expdition, the "Arctic" expedition, and similar services. NFK wants your co-operation, too. The use of these waves for general amateur communication will be open to determination at the September National Radio Conference.

Fifth Paragraph

This paragraph means that the artificial "fence" at 176 meters is abolished and that all forms of amateur transmitters may now freely operate anywhere between 150 and 200 meters

Sixth Pragraph

Everything in these regulations is on a "till-further-notice" basis and is subject to change without warning. The Bureau did not want us to have to wait until the September conference to get the use of short waves, but it should be understood that conference will rehash the general matter of wavelength allocations and changes may result. It is our duty to occupy the newly-authorized areas immediately, to get as much experience therein as possible by late September, and to report this experience promptly to our A. R. R. L. Headquarters so that dependable data will be available when amateur requests for short waves are under review at the conference to be held in Washington at that time.

Let's get busy and make the most of our new world.

Entries Solicited for 1924 Hoover Cup

BY NOW every amateur must be familiar with the Department of Commerce Amateur Cup, the trophy awarded annually during the present administration to America's best all-around amateur station the major portion of which is homemade, under the auspices of the A.R.R.L. With the coming of fall we want to call attention to the fact that it is time to give thot to the entries for the 1924 Cup, the fourth to be given by Secretary of Commerce Hoover. 5ZA got the first one for 1921, 2OM the 1922 one, and 9ZT last year's; you are in line for this year's, OM.

The regulations governing the contest have been printed in *QST* several times, the last time being on page 25 of our issue for November, 1923, so they will not be repeated here; but any interested amateur who lacks particulars can get them by writing to A.R.R.L. Headquarters. The entries must be filed at Headquarters by January 1, with the award to be made on March 1, 1925.

Let us say again that the Hoover Cup is emblematic of the high interest Secretary Hoover has in amateur progress, and that his trophy, the highest honor Amateur Radio has to offer in recognition of initiative in short-wave station construction, is worth real effort to attain. You have a chance to build a new station this fall that will "soakum mortum," as our Inkslingers have it, and by the first of the year establish itself as worthy of this recognition. This may be the last Department of Commerce Cup, so it will justify your effort.

—*K.B.W.*

Working at 20, 40 and 80 Meters

By S. Kruse, Technical Editor

THERE is nothing new about radio work between 20 and 100 meters—some of the first sets ever built worked in that region. Neither is there anything peculiar about the circuits that will work down to 20 meters—our standard circuits only need to be cut down and to be operated with a little more than ordinary care.

That is the first thing to get straight on—THERE IS NOTHING STRANGE ABOUT THE 20 to 100 METER REGION.

Below 20 meters the tube capacities begin to make some trouble and some special stunts must be used, therefore the 4-5 meter band will be talked about in another article next month. This time let us think of the 20-22, 40-43 and 75-80 meter bands.

Beginning at the Beginning

It is absolute nonsense to start sending and receiving at 40 meters unless one knows where 40 meters is. Don't do it—just for once break all amateur traditions and make a wavemeter FIRST. The way to do it is told in this issue.

The Next Step

The next thing is the receiver. A receiver is cheap and a mistake does not result in $30 blowouts. After a receiver has been made and put to work we will have some idea of what short-wave apparatus looks like and can tackle the sending set with some sort of assurance.

Looking at Figure 1 we have the well-known Hartley circuit oscillator with shunt

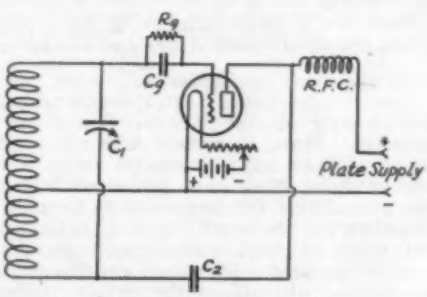


FIG. 1 A HARTLEY OSCILLATOR WITH SHUNT FEED

feed thru an R.F. choke. Since any oscillating circuit can be made to send or receive C.W. we may as well start with this dependable circuit.

The simplest way of turning the Hartley circuit into a receiver is shown in Figure 2. The tuning condenser C_1 has been moved so that it goes across the grid part of the coil only instead of going across the whole coil. The plate stopping condenser C_2, has been made variable so that the feed-back can be controlled. The antenna can be connected to the set in the

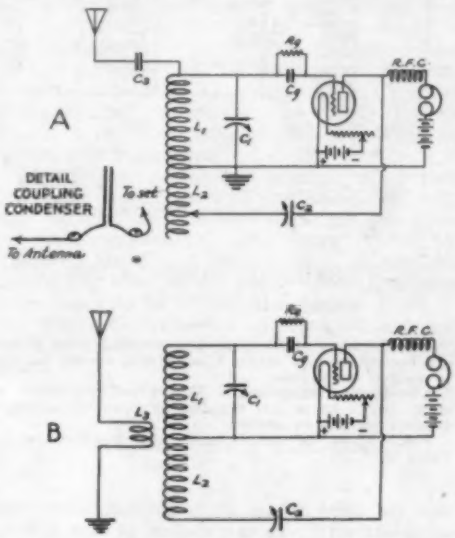


FIG. 2 THE HARTLEY CIRCUIT AS MODIFIED FOR RECEPTION.

C3—Antenna coupling condenser. Made of two pieces of wire or metal strip screwed to base as shown in Fig. 2a. Regulate antenna coupling by bending or cutting.

For values of other coils and condensers see Table A.

fashion shown in Fig. 2a or it can be coupled in the usual fashion which is indicated in Fig. 2b. The first method is certainly simpler, altho the coupling cannot be changed very readily. The second method allows the coupling to be changed but unfortunately the antenna has a big tuning effect and changes the secondary wave around in great style.

A scheme that gets around both of these difficulties to a considerable extent is the well-konwn Reinartz circuit. This circuit is another modification of the Hartley circuit and is pretty well explained by Figure 3.

Another Kind of Reinartz Tuner

Still another sort of tuner that works at short waves is shown in Figure 4. This circuit was also devised by Reinartz and goes back more nearly to the original

Hartley circuit in order to reduce matters to a single coil which can readily be changed to get different wavelength ranges. Because of this interchangeable feature the circuit was first presented in Radio News under the name of the "All-wave" tuner.

These Hartley-type tuners have been described in detail for the good reason that they are the simplest of all the tuners that

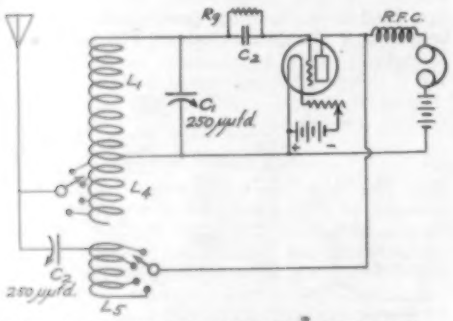


FIG. 3 - REINARTZ MODIFICATION OF HARTLEY CIRCUIT

L4—Primary coil. Continue winding after finishing secondary and make 4 additional turns, tapping to switch as shown.

L5—Plate tickler coil. Use 1 or 1½ times as many turns as in L1, tapping at even distances to 4-point switch as shown.

For values of other coils and condensers see Table A.

can be used while still getting some sort of selectivity. It is possible to use a short (ten foot) antenna with a single circuit tuner but everything that happens in the room changes the tuning. It is also possible to use the usual variety of moveable ticklers but that can be worked out a bit later.

There is also no reason why Colpitts-type tuners cannot be used and the circuit is given with some possible changes in Figure 5.

Curing Troubles

This sounds well so far but there will be more or less trouble in making tuners work perfectly below 80 meters. To begin with it is absolutely necessary to get rid of all stray capacities and resistances.

At 20 meters no condenser that does not have the plates soldered together is entirely allright, and of course it should have the best of insulation. The coil should be spaced and should have its turns supported by nothing—as nearly as possible. The type of coil shown on page 41 of our August issue is nearly ideal but much too large.

Sockets and tube bases should be removed —they have no business in a 20 meter set. The arrangement in Fig. 6 was suggested by our Department Editor altho we later found out that the same plan has been in successful use at 1ARE for a year or more with marked improvement in results.

We really need a tube with the grid and plate leads coming out at different places and it is a good idea to get hold of some British Marconi V24 tubes if possible. The next best thing is the C-299, used without a socket. Next after that comes the standard tubes with their bases removed.

To take the base off heat as shown in Fig. 7 until the cement at the top of the base becomes soft and the base can be carefully twisted off with a pair of gas pliers.

The Antenna for Receiving

As long as receiving only is to be done the antenna problem does not have much importance. In the schemes shown here it is possible to run with the antenna very far off tune while still getting very fair results. However those not having done work below 100 meters are promised a great surprise when they hear the signals that can be brought in at 20 or 40 (or even 80) meters while using an indoor antenna strung across the room.

The Transmitting Oscillator

The new rules of the Department of Commerce *demand inductive coupling* between the sending set and the antenna. This is a very wise provision when sets are to be run during the quiet hours. I believe this ruling is of much more importance than it would be to demand D.C. plate—in fact D.C. plate has an unhappy way of "thumping" terribly when the key is used. Phones are forbidden, and so are sparks.

This means that all of our sets will boil down to something along the line of Fig. 8.

Merely loose coupling the grid or the plate *is not enough*, they must *both* be taken off to make a job that will get by the supervisor.

How much longer are we going to stand direct coupling between 150 and 200 meters?

Tubes

The oscillator itself can use any standard circuit and should use *as few tubes as possible*. More than two will not operate in parallel to any advantage at 80 meters and at 40 or 20 it isn't worth while to use more than 1. Of course it is possible to "monkey" with more tubes and finally to get them to work but it isn't worth the trouble because a little rain on the antenna insulators will upset the whole business. Therefore use one large tube rather than a "herd" of small ones, the result will be more certain operation, cooler tubes, fewer accidents and a STEADIER WAVE WITH FEWER HARMONICS.

The Primary First

It is best at the start to forget all about the antenna and to get the primary circuit, or oscillator, to working well. Suitable circuits are shown in Figure 9--they are all

old friends, pick the one that you happen to like the best and build it to fit what is said in the next few paragraphs.

Before starting read "Radio Transmitting Circuits", page 26, April, 1924, *QST*.

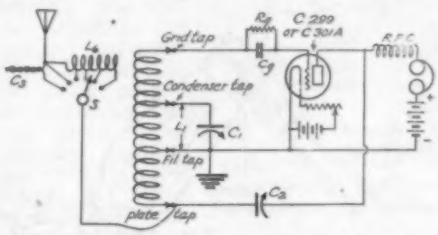


FIG. 4 REINARTZ "ALL WAVE" MODIFICATION OF HARTLEY CIRCUIT

The tuning inductance is a continuous coil tapped 1/5 of the way down for the tuning condenser, and 4/5 of the way down for the other side of the condenser and also the filament. In other words the taps are 1/5 of the way in from the ends of the coil. When using a plain single-layer coil the size of coil and condenser can be found from Table A.

In the original Reinartz design C1 had a capacity of 250 micromicrofarads and the coil was "lumped" together after being wound on an ordinary drinking glass, using No. 16 D.C.C. wire. With this combination the wavelength can be found roughly by the following rule. The turns in the part of the coil above the filament tap multiplied by 10 will give the highest wavelength in meters to which the set will tune. By running a wire from the grid tap to the condenser tap and shorting the top part of the coil the wavelegth at all parts of the condenser scale will drop to ⅓ (roughly). This will work with the "lumped" coil only.

L6—Antenna loading coil to detune the antenna so as to make set oscillate more easily. Size and form of winding does not matter much—50 or 60 turns tapped as shown will do.

C3—Antenna coupling condenser made of two feet of lamp cord either left straight or rolled up. This is the same scheme as used in Fig. 2a but a larger capacity is used as the antenna goes to the plate end of the coil instead of the grid end. The Reinartz arrangement does away with most of the tuning effect of a swinging antenna.

If you read it carefully you can't get mixed up afterward.

The helix must be of the best. That does not mean that it must be expensive. The frame should not be made of any moulded material, or fibre or of bakelite—if these things do not burn up they at least will waste power. Porcelain, pyrex glass, hard rubber and soft wood (dry and cooked in paraffin) are good but must be used carefully. "Carefully" means to use this thin strips of material and to put the frame together with no more hardware than is absolutely necessary. If a hurry-up job is wanted satisfactory results can be gotten by space-wnding wire on a cardboard tube.

Space the wire or strip by its own width or slightly more. Do *not* use strip wider than half inch, wire larger than No. 4 or tubing larger than ¼" outside. Above all DO NOT USE ANYTHING THAT IS STRANDED. Recent experiments show that "Litz" is not good below 200 meters and of course ordinary stranded wires (bare strands) are not good at any wave.

Make a helix about 4 to 6 inches in diameter—more than that will make it hard to set the clips properly. An even smaller turn may be used.

The Primary Condenser

The hardest part of the whole job is the primary condenser. When the antenna is connected this condenser will have a hard enuf time of it—but when the antenna is off things are ten times as bad because most of the power-output of the tube stays in the condenser. Therefore the condenser cannot be too good. A high-grade variable condenser such as the Allen-Cardwell transmitting condenser or the General Radio type 239 (with half the plates removed) is suggested.

If such a condenser cannot be gotten, costs too much, or will not stand the voltage used it will be necessary to use glass or mica condensers. The small leyden jar made by the Stahl Rectifier Co. is good for this work, some of the mica sending condensers being sold from the excess stock of the Radio Corporation of America are useful and finally there is the old reliable photo plate.

There are too many possible combinations

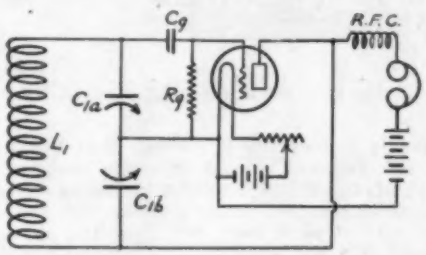


FIG. 5 COLPITTS CIRCUIT
Antenna can be coupled in or attached thru small condenser as in Fig. 2a

In this circuit the tuning ranges can be gotten from Table A if one remembers that C1a and C1b in series must give the capacity stated in the table. To make a convenient tuner of this circuit the two condensers must be belted together or built on the same shaft. It should be possible to use a balanced condenser such as the 4-part Bruno. The Bruno with one section in the grid circuit and the other in the plate circuit, the Sexton or Bruno with the rotor connected to the filament, one set of stator plates to the grid and the remaining set to the plate.

to allow talking about each kind—do your own experimenting.

Getting the Primary into Action

Start out with a low plate voltage and put a hot-wire ammeter into the circuit in series with the primary condenser. The

resistance of the circuit is low and very large currents will be generated—be careful. Then start juggling clips and condensers, keeping track of the wavelength as you go along until the operation of the circuit has become familiar. If you are using an air or glass condenser you may then run the voltage up to normal AFTER taking out the ammeter. This will not do any great harm—if the power is too great for the condenser there may be a breakdown but glass is cheap and air heals itself. With mica the experiment had better not be made.

The Sending Antenna

Before the sending antenna can be built we must settle the question of the way we wish to work it. If the set was always to work at 40 meters the correct thing would be to set up an antenna with a natural wave not too far from 40 meters. Since this

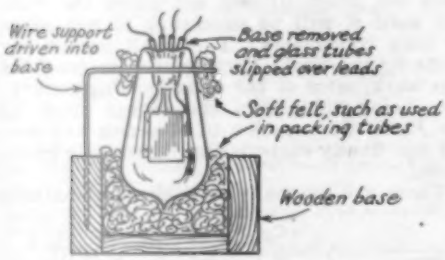

Wire support driven into base
Base removed and glass tubes slipped over leads
Soft felt, such as used in packing tubes
Wooden base

FIG. 6 A "SOCKETLESS SOCKET"

wave is 1/5 of 200 it follows that the size of the antenna would then be about 1/5 that of the usual amateur antenna. Such antennas are not much good at 200 meters tho and it is a safe bet that the station owner will not want to give up 150-200 entirely.

For these reasons it is worth while to think of using the antenna far below its fundamental wavelength. Such work has been done at 1XAM and later at 8XC and 1XAQ. Years ago it was done at old 9LQ (with spark) and still earlier than that at "WB" in Halstead, Kansas. The idea has been the same in each case—tune the primary to the short wave that is wanted and then tune the antenna to 3, 5, 7 and 9 times that wavelength. This was partly explained in "Third Harmonic Transmission" on page 12 of the August issue of *QST*. Since this article was printed last month the circuit can easily be referred to and will not be shown again here. Notice that it does not need any series condensers.

If the harmonic scheme is not used the antenna will probably need a series condenser. If the primary condenser is variable this can be a fixed condenser but if the primary condenser is fixed then the secondary MUST be variable. Bakelite-insulated condensers will do at 80 meters but at 40 and 20 they fail rather soon.

The rest of the antenna system will have to be built in the same fashion that we have been harping on for some months—first

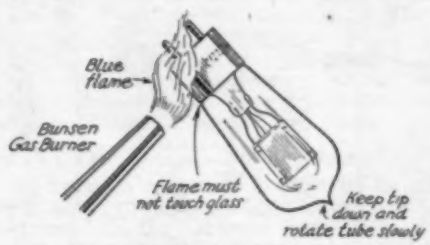


FIG. 7 REMOVING A TUBE BASE

rate insulators, good sized SOLID wire and soldered joints.

The short waves require special care unless the antenna is working far below the fundamental. If that is being done the radiation resistance is very high. As a result the antenna current is very small and the resistance losses are not so important.

Starting Up

After the primary has been gotten into operation and the antenna system decided on the set should be put into use with a very small ammeter in the antenna and the loosest coupling that will give results. There will be a good bit of trouble at first just as there is with loose-coupled circuits at higher waves—but with this difference —when the antenna is off-tune the tubes get COOLER instead of hotter.

The primary will have to be readjusted, especially the plate clip, and the use of the wavemeter is strictly necessary. Before trying to do anything along this line be

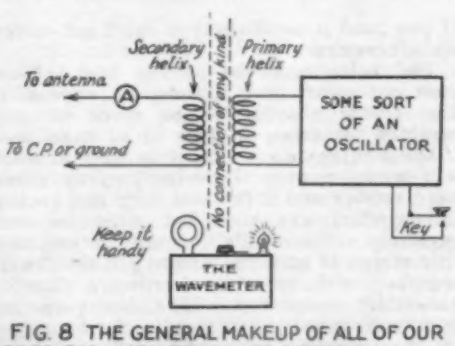


FIG. 8 THE GENERAL MAKEUP OF ALL OF OUR SETS FOR WORK BELOW 80 METERS

sure to read again 9APW's excellent article in the April, *QST*, page 11.

Swinging

Swinging is a pest at 200 meters, an

aggravation at 100 — and the most important thing about the set at 20 meters. Rig up the antenna so it is as stiff as possible, get the key out away from the sending set as far as you conveniently can and use a lot of primary condenser with few turns of helix, rather than the other way around

Don't try to use too close coupling (see what 9APW says about this) and don't run the tubes too hard. It is much better to have a weak steady signal than a wabbling "ether buster" that no one can read. (We here at Hartford have tried for months to figure out the call of one wabbling third district bird that comes in like a ton of brick — never fades—seems to send well — but swings so bardly that he cannot be copied.)

Another thing that makes waves unsteady is trying to use too many tubes. We have a very fine article from the late J. H. Turnbull on this subject and it is hoped that it will be in this issue of *QST* or certainly in the next one, for it is very important in the working of tubes at short waves.

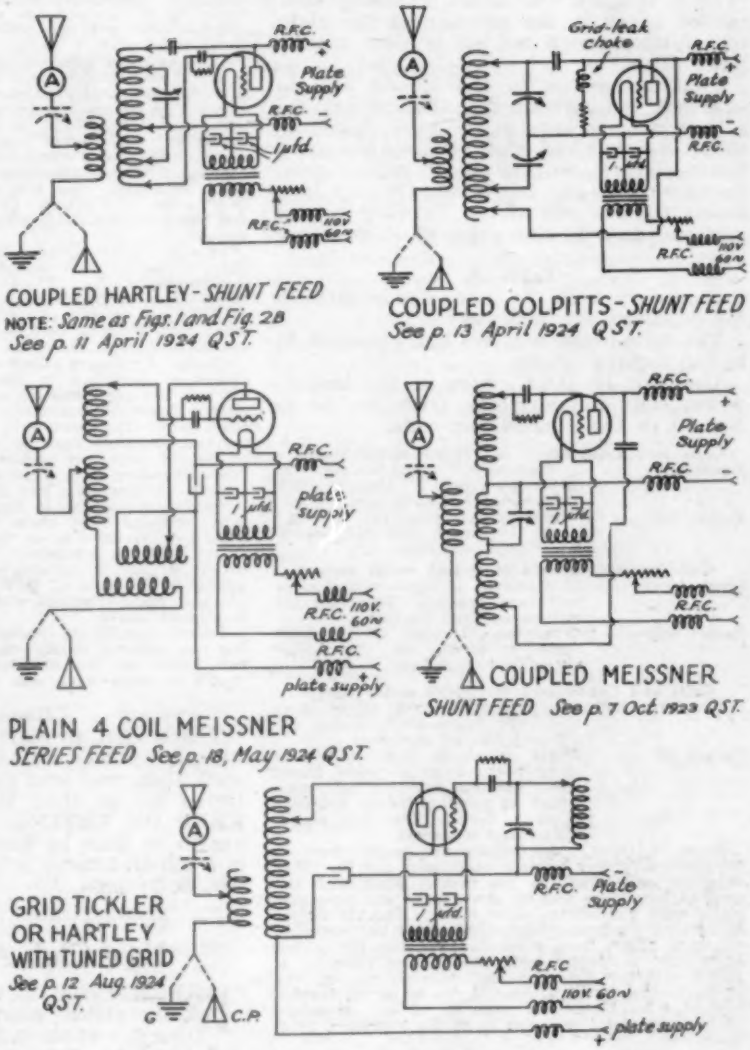

COUPLED HARTLEY - SHUNT FEED
NOTE: Same as Figs. 1 and Fig. 2B
See p. 11 April 1924 QST.
COUPLED COLPITTS - SHUNT FEED
See p. 13 April 1924 QST.
PLAIN 4 COIL MEISSNER
SERIES FEED See p. 18, May 1924 QST.
COUPLED MEISSNER
SHUNT FEED See p. 7 Oct. 1923 QST.
GRID TICKLER OR HARTLEY WITH TUNED GRID
See p. 12 Aug. 1924 QST.
Plate Supply
R.F.C.
1 mfd.
110V. 60~
C.P.

FIG. 9 SENDING CIRCUITS

Master oscillator circuits not shown. All necessary details for this are given in LaPort's article, page 20, June QST. The harmonic transmission schemes can be used with master oscillators.

Important note—Do not key in the tube circuit as you have been doing. Either keep the key in the 110 line and use less filter or else use one of the keying systems described by Turnbull on page 39 of our July, 1924 issue.

By all means read LaPort's excellent "Practical Master Oscillators" on page 20 of *QST* for June, 1924, if you wish to do the very best thing possible in making the wave steady.

Plate Supply to Stop Swinging

This paragraph will surprise many—for I am going to recommend that you do *not* use pure D.C. to begin with. There are several reasons for this. First of all there is the difficulty that the least unsteadiness will make a D.C. station very hard to copy—often entirely impossible. Those who have listened to 1XAE or 8XS will understand this easily enuf. Rectified, or rectified-and-partly-filtered current gets around this. By

"partly rectified" is meant anything that can be keyed in the primary of the plate transformer which can *not* be done with a large filter.

That brings us to the second reason, which is the terrible key thump that results when one keys in the tube circuit itself. This was bad enuf when we had quiet hours—but it will be much worse now. therefore *keep the key in the 110 volt line*, unless you use one of the Turnbull keying systems, described on page 39 of our July issue.

Table A

Secondary coils L_1 and Condensers C_1 for receivers.

The coils listed here are those marked L_1 in the various figures.

Use No. 16 D.C.C. wire in the basket-weave coils and anything from No. 16 to No. 20 in the single-layer coils.

Coils and Condensers for 75-80 meter range

Single layer coil—3" diameter, 16 turns wound so as to occupy space 1" long, use 250 micromicrofarad condenser.

Basket coil———Wind on 11 pins set in 3¼" circle, 18 turns, use 250 micro-microfarad condenser.

Coils and Condensers for 40-43 meter range

Single layer coil—3" diameter, 10 turns wound so as to occupy space 1" long, use 125 micromicrofarad condenser.

Basket coil———Wind on 11 pins set in 3¼" circle, 9 turns, use 125 micro-microfarad condenser.

Coils and Condensers for 20-22 meter range

Single layer coil—3" diameter, 5 turns wound so as to occupy space 1" long, use 125 micromicrofarad condenser.

Basket coil———Wind as above, but wind wire along with string of same thickness, making winding of same length as 9-turn winding but only using 5 turns. Use 125 micro-microfarad condenser.

None of these combinations are exact—there is too much difference between condensers and the effect of wires and sockets is too great. Start with the combinations given and cut down turns and condenser plates until you hit the right range. The 125 micro-microfarad condenser suggested cannot be purchased—remove plates from a standard low-loss 250 micro-microfarad condenser until the desired capacity is gotten. Better operation is gotten by cutting the plates to the "straight line" form or in the fashion suggested by Hassell on page 39 of our December, 1923, number and the page 11 of the February, 1924, issue.

Tickler coils L2 and Plate stopping condensers C2

For the 75-80 meter range use a stopping condenser, C2, of 500 micromicrofarad capacity. For the lower ranges one of 250 micromicrofarad is large enuf.

Number of turns for L2 cannot be given—it depends too much on your tube and antenna—try it out and see. If the set howls easily you have too many turns—if it does not oscillate you have too few. The exceptions are Figs. 3 and 4 where instructions are given.

Antenna coupling coils L3

The antenna coupling coil should have from 1 to 5 turns, depending more on the size of the antenna than on the wavelength. Correct value found by trial—no general rule.

Table B

Coils, Meters, and Condensers for Sending Sets. (Fig. 9)

70-80 meter range

Antenna ammeter—Use smaller meter than usual if regular antenna is being used on harmonics. A meter ½ to ¼ as large will do. If using small antenna and working near its fundamental usual meter will serve.

Antenna condenser—Should be variable if no primary condenser is used or if primary condenser is fixed. If variable primary condenser is used the antenna condenser may be of mica, glass or air and have fixed value of 50 to 200 micromicrofarad. If unable to reach desired wavelength use two condensers, one above and one below secondary helix.

Primary Tuning condenser—Needed only on waves above 50 meters—tube and wire capacity enuf below that point. Variable plate stopping condenser sometimes helpful in getting down to extreme short waves.

Primary helix—Usual 150-200 meter helix, no changes needed, just move clips to secondary helix and proceed.

Secondary helix—Pancake at end of primary helix or helix set at end of primary. If secondary has more than 5 turns keep well away from primary—see *QST*, April, 1924, page 11.

Radio Frequency Chokes—Plate supply circuit chokes as described by Ballantine. Chokes in the 110 volt line same way but using about No. 22 D.C.C. wire. Under no conditions attempt to use honeycomb coils. The small grid leak choke shown in the Colpitts circuit is made by jumble-winding 150 turns of No. 30 wire (or smaller) on a 1" tube. Wire from secondary of a Ford coil will serve nicely. A smooth winding can also be used.

Stabilizing Chokes—If more than one transmitting tube is being used there should be separate grid chokes or resistances as described several times in *QST*. This is explained in detail in Turnbull's article on parallel tube operation. This article will appear in this issue of *QST* or the next one. Do not confuse these chokes with the grid-leak chokes mentioned above.

Transformer shunt condensers—To help in cushioning the keying thump the condensers across the two halves of the filament transformer secondary should be quite large—not less than ¼ ufd.

General

That's enuf to start with. The circuits will all work as stated. If yours does not work then read over the articles I have referred to, go thru Ballantine again and KEEP ON TRYING. This sort of thing has to be done by keeping at it—not once in a hundred times is it possible to cure the trouble by mail.

New Club Affiliations

THE following societies were approved at the annual meeting of the Board of Directors of the A.R.R.L., July 25, 1924, and are duly affiliated with the A.R.R.L.

The 2BNT Radio Club of the Newark Preparatory High School, Inc., 1030 Broad St., Newark, N.J.

Hudson City Radio Club, Inc., 716 Charles St., W. Hoboken, N.J.

Kansas City Radio Transmitters' Association, 8020 Mercier St., R.F.D. 1, Kansas City, Mo.

Polytechnic Radio Club, 626 16th Ave., San Francisco, Calif.

Madison Amateur Radio Club, 1316 Drake St., Madison, Wisc.

Westmont Radio Club, P.O. Box 60, Westmont, Ill.

Yonkers, Radio Club, 19 Marshall Rd., Yonkers, N.Y.

—*F.H.S.*

Transmission Experiments at 8AQO

Part I

By S. Kruse, Technical Editor

A NUMBER of questions in amateur radio, and in short wave radio in general, seem never to have been satisfactorily answered, either by experiment or by theoretical discussion. Some of these problems attracted the attention of Mr. C. B. Meredith and the late Edward Page, both of station 8AQO at Cazenovia, New York. Meredith and Page developed suitable apparatus and methods for attacking the problems and undertook the actual work during the summer of 1923. Since the Technical Department of *QST* was also interested in the same problems, the Technical Editor went to Cazenovia, together with Perry O. Briggs of 1BGF, the four men together with Mr. C. R. Jones doing most of the work. Mr. H. O. Quick of 8BOI also gave much-needed assistance on several occasions.

The actual work of measurement took about ten days. However, the preparatory work, carried on mainly by Page and Meredith, had taken many months.

The suggestions and advice of Stuart Ballantine, of the Radio Frequency Laboratories and Prof. J. H. Morecroft of Columbia University did much to clarify the problem and method.

The "Shack" at 8AQO

The Problems

The three problems which were undertaken were:

A.—The relative merits of a counterpoise and ground. This could of course be settled only for one station since the results depend so completely upon the nature of the soil and the depth of water below the surface of the ground. However, one solution is very much better than none at all.

B.—Determination of the best size of antenna for a given wave length. The application of the results in this case can be regarded as a trifle more general since the tests were made with two different antennas against both counterpoise and ground.

C.—The practical effect of changing antenna insulation. Unfortunately lack of time prevented the completion of this problem.

The station, 8AQO-8XH, carefully worked out through some years past by Meredith and Page, was admirably suited for transmission experiments because it is storage-battery driven and has an antenna system which is very unusually free from the losses and uncertainty that go with most antennas.

The antennas will be described later in this article. For the present it is enough to say that they change from time to time but are always suspended from masts which are 220 feet apart, made of wood, and supported by stays which are broken into 20-foot lengths by insulators. The masts therefore enter into the problem much less than usual.

The set, shown in one of the photographs, is amply large so that it never has to be forced in ordinary transmission and can be run at a very small percentage of its full capacity when used in experimental work. Therefore unsteady transmission, harmonics, and failures are seldom encountered.

Since the photograph was taken the transmitter has been modified somewhat. The antenna and counterpoise leads are spaced six or seven feet apart and are made of rigid copper tubing. This tubing is made in three foot lengths, bolted together so that the system may be inter-

rupted at any point. The joints are solidly made and do not contribute particularly to resistance. During the test the helices were much further apart than is shown by the photograph. The result of this was that harmonics did not seem to appear in the antenna. They could not be found with a wavemeter, a receiving loop at one half mile or at any receiving station within a number of miles, although several of these were able to tune down to the point at which the fifth harmonic should have appeared. Even when operating with the coupling shown in the photograph this station has always been notably free from harmonics.

The Transmitter at 8AQO
Variable antenna series condenser at the left with secondary helix next to it and primary helix just back of that. The mica primary condensers stand on the table between the primary helix and the tubes. Each of the UV-204 tubes is equipped with separate filament rheostat and voltmeter. The grid-leaks and the keying relay are at the left of the rheostats. The antenna and counterpoise leads shown in the picture were replaced by copper tubing before the experiments were made.

The Power Plant

The filaments of the transmitting tubes are heated by a storage battery. The plates are supplied by a motor-generator set operating on storage battery. The batteries are large enough so that an absolutely constant signal can be maintained with the key down for three hours at a stretch, even after the "gassing peak" of the batteries has first been worn down. The constancy of the signal can better be appreciated when it is known that a reflecting galvanometer with a scale 25 centimeters long will show no appreciable change in the received signal for an hour at a time.

The Grounding System

The station cellar was first dug out seven and one-half feet deep, the ground plan being 18 by 36 feet. At the center of this area there was dug a small well 4 feet square and 2½ feet below the cellar floor. A sheet of copper netting was then laid over the whole cellar floor. The main grounding system, consisting of many radial copper strips 100 feet long, was then buried with the ends brought in over the copper netting and soldered to it. Both the netting and the copper strip come into the central well at which point a stranded lead one inch in diameter goes up to the transmitting room. Before laying the cellar floor the copper netting was covered with a heavy layer of charcoal and the well was filled with salt. This well is kept constantly full of water with the results that the ground resistance remains quite constant and uniformly low.

The Counterpoise

The counterpoise is a wheel, consisting of 30 wires which are stretched radially from the lead-in on the station roof (18 feet off ground) to 44,000-volt porcelain insulators carried on pins screwed to 7-foot fence posts. Each wire is 70 feet long. The outside ends are not connected together.

The Building

The station house is of wood with a tarred and sanded roof. The antenna and counterpoise come in through this roof through very large electrose bushings placed far apart. Several wires are omitted from the counterpoise so that the antenna bushing does not come within four feet of any portion of the counterpoise. The battery and generators are placed in the cellar. All light and power wires in the station are kept as far as possible from the radiating system and the primary circuit. In addition they are protected by frequent transpositions and by radio-frequency chokes. Wires leading to the bulding are run in lead cable put into conduit and buried three feet deep for a distance of 500 feet from the building.

The Method of Measurement

It is pretty generally agreed now that the way to test a transmitting station is to transmit with it and to measure the field at a place not too close to the station. If this is done at various wavelengths with a known amount of power *into the antenna* at the sending station, one is in a position to find out something definite about the station performance. It is of course necessary to have,

1. Complete information as to the r.m.s. current and the power put into the sending antenna.

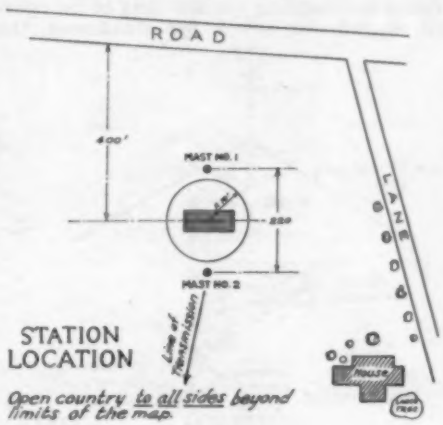
2. A reliable method of measuring the field strength at a distance.

3. Certainty that something between the transmitter and the receiver has not absorbed or reflected the energy.

These things will be taken up in turn.

Measurement at the Sending End

Before one can tell how much power is going into the sending antenna one absolutely must know the resistance and the current in it, since the power is I^2R. Therefore the first thing was to run a resistance



curve of the antenna over the range of waves we desired to work on, namely from 150 to 350 meters. This had to be done for each antenna and we believe that it was done carefully enough so that the results are entirely trustworthy. The method is the well-known resistance variation method, using the circuit shown in Figure 1. Objection will immediately be raised to this method. However, the added resistances were always kept very small as compared to the antenna resistance so as to avoid changes in the current distribution. This does away with most of the errors of this method. The extreme regularity which these measurements checked leads us to believe that this method is satisfactory. However, it was absolutely essential to use the tuned intermediate circuit as shown and to keep the current in the tuned intermediate circuit constant at any one wavelength by changing its coupling to the primary (driver) circuit to assure constant e.m.f. in the antenna. Whenever such a change was made the wavelength was very carefully checked by means of a General Radio Precision wavemeter. It seldom changed measurably. Attempts to couple the driver directly to the antenna were uniformly failures because endless adjustment was required.

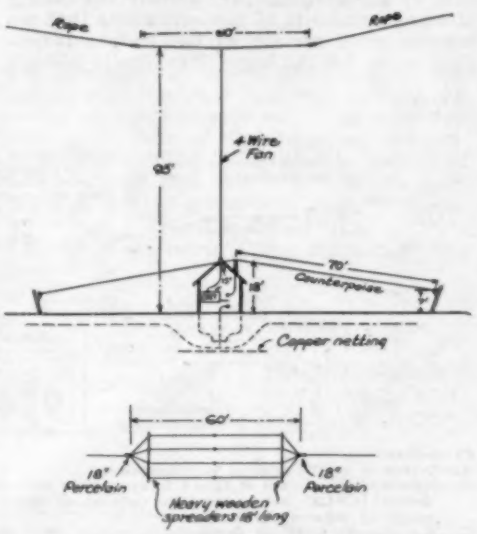
The Nodal Point

Before antenna resistance measurements can mean anything it is necessary to decide at which point in the system one should measure. It was decided in this case to use the point of largest current in every case. This was done by the scheme shown in Figure 2, the current maximum being located by keeping the reading on meter A1 constant while meter A2 was moved around until the point of largest current was located. This same process was repeated at a number of different wavelengths, for each antenna system which was used. The results are shown in Fig. 3.

In addition to this it was necessary later on during the tests to move the antenna ammeter around so that it was always at this proper position.

The Line of Transmission

To escape the localized effect around the antenna it was necessary to measure the field at a considerable distance. A point was located about 3000 feet distant at which it was possible to gain a clear view of the station. A small wooden house was erected at this point and a very rigid receiving loop built five feet off of the ground, in front of the house and on the side toward the sending station. Overhead telephone and power wires were removed from the space between the sending and receiving station. It was also found necessary to remove a field telephone set although the last hundred yards of the line were twisted pair and ran to the receiving house on the surface of the ground.



THE "NUMBER ONE" ANTENNA
FUNDAMENTAL TO EARTH 272 m.
FUNDAMENTAL TO COUNTERPOISE 221 m.

There were no trees or houses in the line of transmission or for a considerable distance to either side.

The Receiving System

The receiving point was on high ground, being about level with the top of the sta-

tion masts. There were no trees anywhere near the back or sides of the receiving house, those which appear in the photograph to be touching the house are the closest ones and are at least 200 feet away.

The field strength was determined by measuring the current in the receiving loop and then calculating from the dimensions of the loop and its resistance at the working wavelength. Before any of this could be done it was necessary to make sure that the loop was receiving properly. Since the apparatus was on the same level as the loop and connected to it by a short length of "twisted pair" there was not much antenna effect to worry about. It was also found that when the power in the sending antenna was changed the field strength was proportional as it should be. This was tried at a number of wavelengths.

The resistance of the receiving loop was determined by the usual series resistance method. The driver was the sending station itself; *certainly the coupling was loose enough* as the distance was 3000 feet. There was considerable difficulty in this measurement since the received current was being indicated by a galvanometer working on a thermo-junction. Both of these devices are slow in action and it was only by the greatest care and by the taking of many hundreds of measurements that we became quite certain of the proper resistance curve for the loop. Eventually enough familiarity with the response of the galvanometer was gained so that these measurements could be made at a fairly rapid rate and could be made to check each other with certainty.

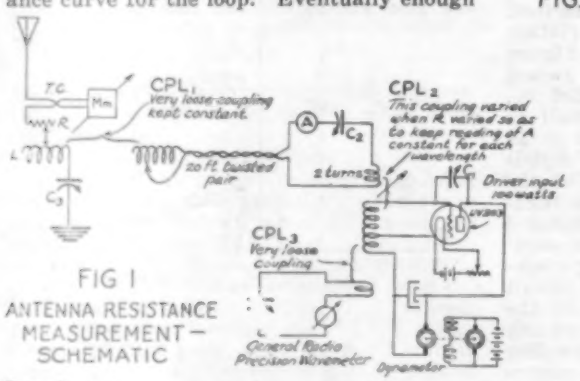


FIG 1
ANTENNA RESISTANCE MEASUREMENT—SCHEMATIC

Procedure—
A—Driver is set to desired wavelength
B—Intermediate circuit is tuned to resonance and coupling to driver (CPL2) set to produce current of about 1⅓ amperes in intermediate circuit.
C—Wavelength checked carefully.
D—Antenna tuned to resonance by means of C3 and current read at Mm.
E—Known r.f. resistance introduced at R.
F—Coupling CPL2 adjusted to produce same current thru A.
G—Current read at Mm.
H—Repeated with different valves of R.
I—Antenna R for the particular wavelength calculated and resistance of thermo-couple T.C. subtracted.

It is not known if this has a very definite bearing on the matter of loop resistance but it may be worthwhile to mention that the ground under the loop consisted of four inches of clay over shale.

Measuring the Loop Current

Since the sending station was to be operated at reduced power for steadiness, the loop current would of course be small. Therefore a Rawson vacuum thermo-couple of considerable sensitivity was used and connected to a Leeds & Northrup type R reflecting galvanometer as shown in Figure 4 Such a combination can be calibrated but it is the demon's own job to make a calibration stay constant. No attempt was made to do this. After each series of measurements (15 minutes) the transfer switch was thrown and direct current run through the thermo-couple from the local battery until the galvanometer gave the same deflection. By means of the rheostats and potentiometer it was easy to get the same deflection that had just been obtained during the transmission test. Therefore the galvanometer did not need to stay constant for more than 15 or 20 minutes at a time and the reliance was placed entirely upon the Rawson multimeter which had previously been checked at Syracuse University against a potientometer. At the end of the experiment it was checked once more and found to be O.K.

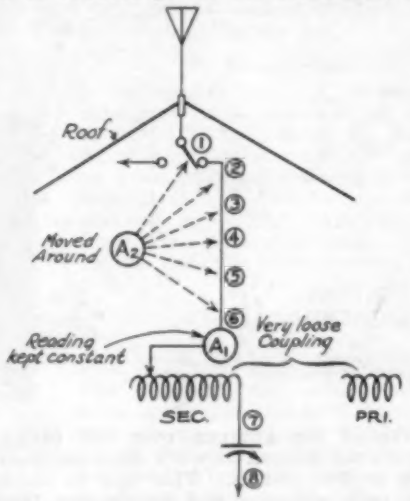


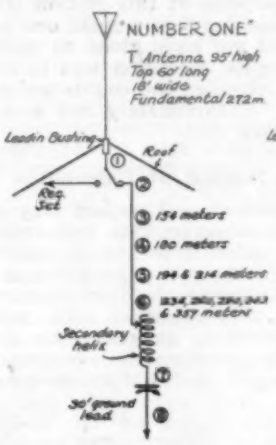
FIG. 2 LOCATING NODAL POINTS

It is worthwhile here to emphasize the

fact that this arrangement was *completely reliable and infinitely easier to use* than a calibrated galvanometer which is everlastingly needing correction. The reversing switch in the battery circuit was soon given

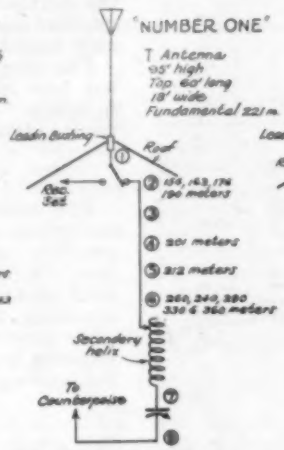
After this the transmitter was moved to another wave and another measurement made; with luck one of them could be completed in about 40 minutes.

When the whole thing had been done



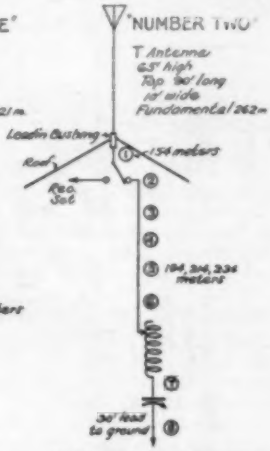
Nodal points for Number One antenna and ground Meter positions ① ② ③ etc, are 3 feet apart.

FIG. 3A



Nodal points for Number One antenna and counterpoise Meter positions ① ② ③ etc, are 3 feet apart

FIG. 3B



Nodal points for Number Two antenna and ground Meter positions ① ② ③ etc, are 3 feet apart

FIG 3C

up as the most careful test demonstrated that the thermo-couple was perfectly reliable with direct current flowing in either direction.

The Measurements Themselves

A measurement series was run in this fashion. The transmitter was set to the wavelength desired very carefully by means of a General Radio Precision wavemeter. It was then allowed to run while the receiving loop was very carefully tuned to the same wave. Because of the slow galvanometer this took several minutes if accurate work was wanted. Sometimes it was necessary to change the power at the sending station before a good deflection (for instance 15 centimeters) could be secured. Generally the sending power was too large at the start. When everything had become perfectly steady the loop resistance was measured by the series resistance method. The sending set was then allowed to run for 5 additional minutes and current readings taken at both the sender and the receiver every half minute to make sure that things were actually steady. If any shifting happened the whole thing was done over. The wavelength was measured at the sending station at both ends of each run.

several times for one antenna system this system was removed and the process repeated on another antenna. Two antennas were used, both of them against counterpoise and ground. The entire series of measurements took over two weeks as there was much delay because of rainy weather.

Weather Effects

Early in the work it was found that dew on the ground under the counterpoise had a considerable effect upon the transmission because it changed the antenna resistance.

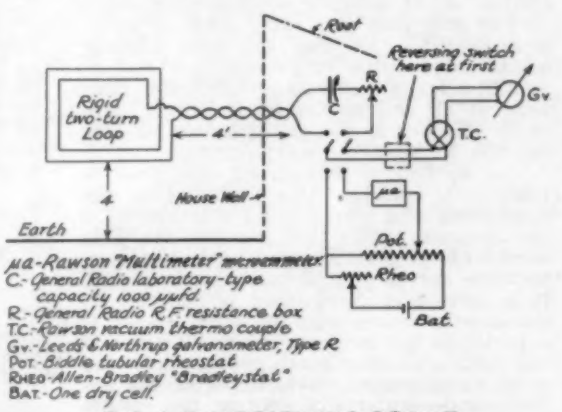
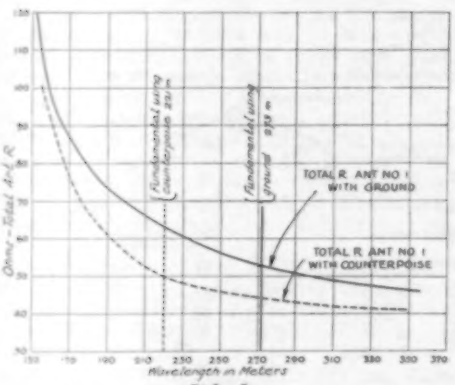


FIG. 4 THE RECEIVING CIRCUIT

The loop on the other hand was not bothered at all by this sort of thing; in fact a fairly heavy rain did not change the loop resistance more than a per cent or so until water was actually dripping from the


Ohms—Total Ant. R
Fundamental using Counterpoise 231 m
Fundamental using ground 270 m
TOTAL R ANT NO 1 WITH GROUND
TOTAL R ANT NO 1 WITH COUNTERPOISE
Wavelength in Meters
FIG 5

frame. Measurements made during the following winter showed that snow had a much more serious effect.

It is interesting to notice that when the sending antenna was used against the *ground* connection neither dew or rain had the *slightest effect*.

Ground Against Counterpoise

Comparisons between a ground connection and a counterpoise do not ever give a universal law. When one is done with a certain station one can only say "At this station or at another station very much like it and with the same kind of earth underneath it we can tell you whether to use counterpoise or ground."

Still, a few measurements are better than none at all and as far as is known there is no exact information available on this problem at amateur wavelengths.

The method of comparing the two is reasonably evident. One first had to run resistances and locate nodal points for the two systems. After that transmission tests were made at various wavelengths and comparative curves plotted as shown in Fig. 6. It is seen that the ground is superior at the shorter waves and the counterpoise is superior at the longer waves. However if the antenna-and-ground system has the same fundamental wavelengths as the antenna-and-counterpoise system the results will be materially different. This will be taken up in greater detail in the second installment of this article.

The ground under the station, like that at the loop, is clay over shale, excepting that the shale lies rather deep at the transmitting station. In a location very much like this, and with an average amateur antenna, it would seem that the counterpoise should be decidedly better. This too, must not be stretched too far. Remember that the counterpoise at this station is a rather unusual one and that a small one very probably would not have given as good results.

The original intention was to remove all but four wires of the counterpoise and try it again. Unfortunately bad weather prevented doing this.

Method of Calculation

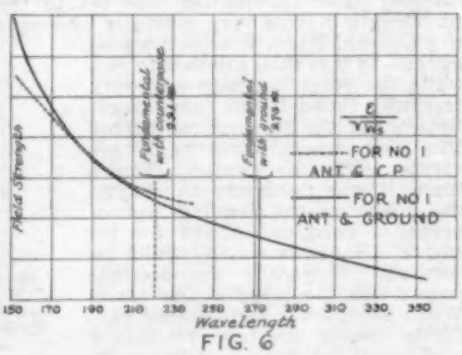
The simplest and easiest way of translating the measurements into something of practical value is to plot a curve showing how, (with the power kept constant in the sending antenna) the field strength at the receiving loop changes with wavelength. This proceedure, suggested by Ballantine, requires translation of the loop current into field strength by the formula given below.

$$\varepsilon = \frac{i R \lambda}{2 \pi A n}$$

ε = field strength in volts per meter
R = loop resistance at the working wave
i = loop current in amperes
λ = wavelength in meters
A = loop area in square meters
n = number of turns in the loop.

It is assumed that the loop is small as compared to the wavelength.

This method does not necessitate knowing anything about the effective height of


Field Strength
Fundamental with counterpoise 231 m
Fundamental with ground 270 m
E / Vhs
FOR NO 1 ANT & C.P.
FOR NO 1 ANT & GROUND
Wavelength
FIG. 6

the sending antenna, radiation resistance, or anything else of that same sort. It looks at the problem from the purely practical standpoint of "how much power must I put into this sending antenna to make the field as strong as I need it at the receiving point?" This is an eminently practical way of looking at it.

(To be continued)

How to Change Your Neutrodyne for 100-Meter Phone or C. W. Reception

By Frank H. Jones, Cuban 6KW

THE interest in 100-meter work is still progressing by leaps and for some months past I have been experimenting with various receivers, tearing off wire here and taking out condenser plates there. All the published schemes of *QST* have been tried and I also have a Grebe 13 receiver which is a fine set on C.W. but which I find hard to control when it is on the verge of oscillation, as it must be to receive 100-meter radiophone at distances over 1000 miles. My 100-meter phone reception is all long-distance work, KDKA is 1250 miles and WGY is 1500 miles, from 6KW.

I finally tackled my neutrodyne. The first neutroformers originally had 66 turns, with the antenna tap 15 turns from the top. The second and third coils had 66 turns with the winding tapped at 15 turns, and a 5-turn primary inside.

Leaving the taps as they were I took off 8 turns above the tap (leaving 7) and then I took off 26 turns below the tap (leaving 25). This arrangement got down to 150 meters with the same 15-plate condensers as before, but neutralizing at 150 meters took me a whole day and even then the tubes went into oscillation occasionally. I thought "If it is this hard to neutralize at 150 meters, what will I be up against at 100 meters?".

However, I decided to give it a try. Off came more turns, leaving 4 above the tap and 20 below the tap, still using the 15-plate condenser. This got down nearly to 100 meters at above 10 degrees on the dial.

100-meter telephone signals were impossible although short wave C.W. came in very nicely. I guess I spent a week trying to neutralize the thing at 100 meters but it simply wouldn't "neut".

I then went back to our old friend (?) the potentiometer to control the grid biases. Disconnecting all the grid leads from the negative side of the A battery I connected in my "losser". This made phone reception possible but by the time osciilation had been damped out not a very hearty signal was left and adjustment was extremely critical. Next, to make tuning somewhat easier I took out the rotors of the variable condensers and removed all but one plate from them. This facilitated the necessary tuning adjustments but the set wasn't anything great although you could receive phone, and C.W. came in in great shape from all you fellows in the U.S.A., from England and from France.

It occurred to me then to try out the superdyne method of neutralizing, so I made some little coils having 12 turns and mounted one in the antenna coil and one in the second neutroformer half an inch from the top. Now the 5-turn primary instead of going directly the positive B battery first went back to the little coil in the previous stage and then to the B battery.

With these two coils set almost any way the set will oscillate like a house afire and C.W. comes in like the proverbial ton of bricks with the loud speaker directly in the detector. KDKA's phone transmission on 100 meters is heard with fine volume on loud speaker plugged into the detector only, and with one stage of audio is loud enough to be used for dance music. This is with 22 volts on the detector and 90 on all of the amplifiers. UV-201-A tubes are used.

Tuning is moderately complicated. First one sets the dial at about 30 and moves the two reversed feedback coils until the carrier wave is picked up. Then the three dials are adjusted to approximate zero beat, and finally the reversed-feedback coils are adjusted to clear up reception, possibly readjusting the condensers a little at the end. It sounds pretty complicated but in fact it is not so, especially as in receiving C.W. one can leave out a portion of this procedure .

The set in this condition seems to cover a band of about 50 meters although I am not very sure about it. My wavemeter is doubtful around 100 meters.

Of course if you don't want to spoil your neutrodyne set for its regular range of 220 to 550 meters you might try bringing out taps on all the neutroformers to 4- or 5-point switches. You would have to leave in all of the condenser plates, which would make tuning pretty difficult.

All through this procedure the neutralizing condensers may be left in; they seem to make very little difference.

The Annual Board Meeting

THE first meeting of the recently-elected Board of Directors of the A.R.R.L. was held in Hartford on July 25th and 26th, with every director present in person except Mr. Dobbs of the Southeastern Division, who sent Division Manager H. L. Reid as his alternate, and Mr. Babcock of the Pacific, who was unexpectedly and unavoidely detained in Mexico City where he was a delagate of the United States at the Inter-American Electrical Communications Conference. The meeting started at 10:30 a.m. and with stops for meals and ran until 10:30 that night, and similarly the second day until 2:00 p.m., when the last of the business was concluded. It was a fine inspiring meeting, thus to have representatives present from every section of the country, knowing just what their members "back home" wanted to see done and all pulling together for A.R.R.L. advancement.

THE BOARD MEETS AT HARTFORD. Left to right, standing in rear, H. L. Reid, alternate for Mr. Dobbs, Southeastern; Mr. Gravely, Roanoke; Vice-President Stewart; Mr. Corlett, West Gulf; Mr. Pinney, New England. Seated, left to right, Mr. Laizure, Midwest; Mr. Bidwell, Atlantic; Prof. Jansky, Dakota; Mr. Weingarten, Northwestern; Mr. Segal, Rocky Mountain; Traffic Manager Schnell; President Maxim; Secretary Warner; Mr. Painter, Delta; behind Mr. Painter, Mr. Darr, Central; in foreground, Treasurer Hebert. Canadian General Manager Russell and Pacific Director Babcock were not present when this photo was taken.

This was the first meeting of the Board elected under our new Constitution, and it was very successful.

The following resumé of the actions taken is published for the information of the membership at the instructions of the Board.

The annual reports of all of the officers were heard. Mr. Maxim and Mr. Stewart were unanimously re-elected president and vice-president, respectively, and the secretary, traffic manager and treasurer were unanimously re-appointed to their respective positions. With Vice-President Stewart presiding at the time Mr. Maxim was re-elected president, the Board unanimously adopted the following resolution, with instructions that it be published in *QST:*

Whereas we, as a Board of Directors, cognizant of the sentiment of the entire membership of the American Radio Relay League, feel that the strength of our organization, the international repute of our League and its high standing in the eyes of our government, are due primarily to the devotion, sincerity and ability of our beloved president, Hiram Percy Maxim: now therefore

BE IT RESOLVED that we, the Board of Directors of the American Radio Relay League, do on our own behalf and on the part of the entire membership of the League, tender to Mr. Maxim this unanimous expression of our confidence, love, esteem and appreciation.

Chairman Bidwell reported for the Railroad Emergency Service Comitmtee, and the general subject of expanded effort in this direction was referred to the Traffic Manager for study and report at the next meeting.

Seven clubs were affiliated, as reported eleswhere.

President Maxim's activities abroad in encouraging international amateur work were approved, the International Amateur Radio Union was endorsed, and it was agreed that A.R.R.L. will encourage the I.A.R.U. in every proper way.

A new division to be known as the Hudson Division was created effective Sept. 1st, consisting of certain counties of New Jersey and New York enumerated elsewhere in this issue, which territory was formerly a part of the Atlantic Division, and an election ordered for a Director therefrom, to hold office until Jan. 1, 1926.

The international auxiliary language Esperanto was endorsed, as per an announcement elsewhere in this issue.

The financial statement for the second quarter of 1924, published elsewhere in this issue, was approved and accepted.

The Executive Committee was authorized to carry on in the name of the Board, between the Board's meetings, as provided in the Constitution.

The By-Laws were amended to provide that when there is but one eligible nominee from a territory, ballots will not be sent out but the Secretary will cast one ballot to elect the nominee and postcard notices will be sent the membership of that territory so advising them.

Reports were heard from every director of conditions in their respective territories, with recommendations for action.

At the suggestion of Prof. Jansky, a committee of three was ordered appointed by the president to work out a scheme for handling college radio work.

Arrangements were made to hold a meeting soon of a representative Canadian amateur from each Canadian Division, to meet with the Canadian General Manager to discuss Canadian A.R.R.L. affairs, and the necessary funds were authorized.

The name of the East Gulf Division was changed to the Southeastern Division.

A Legislative Committee was appointed, consisting of Messrs. Maxim, Stewart, Segal, Babcock, Jansky and Warner, to handle legislative and regulatory matters.

The matter of the size and nature of Traffic Dept. reports in *QST* was referred to the Executive Committee, as was the study of increased requirements for League membership.

$200 was appropriated for the advancement of the I.A.R.U.

Thruout the sessions of the Board it was evident that one of our chief problems is that of contact, and that misunderstandings cannot arise where proper contact is maintained. The following important resolution, introduced by Mr. Segal, was unanimously adopted:

RESOLVED: that the Executive Committee be authorized and is hereby directed to withdraw from the available funds of the treasury of the A.R.R.L. sufficient money to insure adequate contact by means of traveling representatives from Headquarters with members of the League in all the sections of the country, and to insure the attendance at all duly authorized state, district and division conventions of sufficient official representation on behalf of the League; and that it is the sense of the Board of Directors that the purpose of this authority is to secure contact with all sections of the country and benefit the A.R.R.L. spirit absolutely, so far as is consistent with our means.

The Board expressed its appreciation of the standard frequency transmissions of the Bureau of Standards and requested that the Bureau increase the scope of these transmissions by the use of more stations, by covering the frequencies above 1500 kilocycles, and by transmitting at more frequent intervals, also suggesting that some system of such transmisison by selected amateur stations to be worked out with the Bureau.

An International Relations Committee of three members, with President Maxim as its chairman, was ordered appointed, with the duties of its name, also to work towards a foundation for international amateur radio work.

The Board went on record as opposed, except under extenuating circumstances, to inauguration of any quiet hours on waves below 150 meters, to the continuance of the present extension of quiet hours beyond Oct. 1, 1924, and to the abandonment of any of the wave band between 150 and 220 meters; and as desirous of obtaining an allocation somewhere between 100 and 150 meters. Thruout the sessions the greatest interest was displayed in short waves, almost every director recording his division as anxiously awaiting their assignment.

—*K.B.W.*

Wavemeters for the New Ranges

By S. Kruse, Technical Editor

A WAVEMETER to cover the 20, 40 or 75 meter band can have just the same sort of construction that all of our other wavemeters have. The wavemeter to cover the region from 4 to 5 meters will have to be built differently and that will be taken up next month in a separate article covering receivers, transmitters and wavemeters for those waves.

General Principles

First, let us get straight on the proper construction for a good wavemeter, for short waves or for any other wave. Dig back through your files of *QST* and read our two articles on amateur wavemeters which were published on page 22 of the February issue and page 20 of the April isue.

Continuing Downward

First we will suppose that you have made and calibrated a wavemeter as described in those articles. If you have not done this then study the articles and get this part of the job over with. You now have a wavemeter that goes down to approximately 90 meters. It would be possible to make coils for this wavemeter to go down to 20

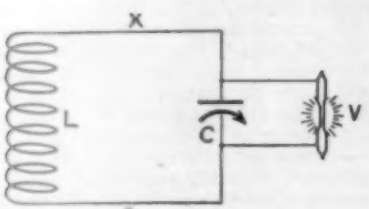


FIG. 1

Wavemeter Covering the New Bands
C—Solidly built variable condenser of type having insulated end plates, or better of type having strip insulation. Bushings not suitable for this work. Capacity 1000 micromicrofarads (.001 microfarads).
L—Coil wound on 2" tube. Use 8-12 turns any double cotton covered wire smaller than No. 12 and larger than No. 26. Space turns so winding will be 1" long. Then try meter and remove one or two turns until wavelength at top setting is not over 110 meters. For good method of winding see page 23, February QST.
V—Vacuum tube from Airco Ignition Gage or Westinghouse "Spark C". This may be omitted. Lamp may be used at X but be sure that it is not over a 3 volt lamp—the smaller the better.

meters. This can be done by adding to the coils given on page 2 of our February number, two additional coils of 4 and 8 turns. As before, these windings *must* be made so that they are one inch long and four inches in diameter. If the turns are crowded together the range will not be right.

A more convenient thing is to rig up a combination which will cover all three of the new bands. This can be done by means of the combination shown in Figure 1.

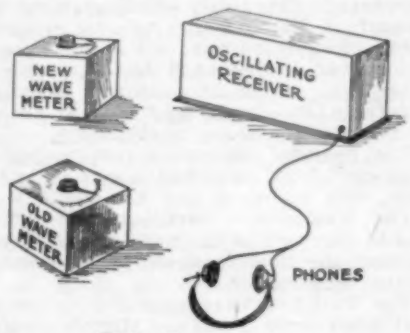


FIG. 2

Setup For Calibrating New Wavemeter On Short Waves From Old Wavemeter That Does Not Go Below 100 Meters.

Read page 23 in the February issue for details on building the coil.

Calibration

Begin by setting up apparatus as shown in Figure 2. Get the receiver to oscillating on some wavelength near 200. Tune in your old wavemeter and find resonance by the click method described on page 22 of the April number. Now read your *old* wavemeter and mark down this wavelength as shown in Table 1. In this case we are going to take advantage of the fact that the "click method" not only will indicate resonance with the fundamental frequency of an oscillator (in this case the receiving set is the oscillator) but will also indicate resonance with the half-wave (second harmonic double-frequency). In other words, there will be a click when you run into resonance with the fundamental frequency and another at the second harmonic. You can distinguish between the two by the fact that the coupling between the receiving set and the wavemeter-coil will have to be closer to get the click on the harmonic than on the fundamental. There will also be a click on the third harmonic (one-third the fundamental wavelength) but the coupling will have to be still closer to get this. Work with the coupling as loose as possible and the only ones you will get will be on the fundamental and on the second harmonic. Leaving the receiving set ab-

solutely alone, carefully tune down with your old wavemeter and look for another click at one-half of the wavelength you have just found. Perhaps you will have to change to the smaller coil to do this. You may have to use slightly closer coupling also but whatever you do, do not change the adjustment of the receiving set during this time. When you find the second click you should be on just one-half of the wavelength. Since we set originally at 204 meters this will be 102 and should come within the range of the new wavemeter. Leave the receiving set alone while you tune the old wavemeter off the half wave and attempt to get a click on this wave by using the new wavemeter. Suppose we find it at 96 on the scale of the wavemeter and put this down in the table. We now have one point on the new wavemeter, we know that 102 meters comes at 96 degrees on the scale. Now go back and set the old wavemeter at 180 meters, tune the receiving set near this value and then go again to the wavemeter, tuning it for exact resonance. Suppose this comes out to be 183 meters. We now drop down and hunt the half wave as before. All this time we are checking the standard wavemeter as well as locating some new waves. This is not absolutely necessary but it gives one a double check of the second harmonic which we are using to calibrate the new meter. Having located the 91.5 meter tune with the old wavemeter we throw it slightly off tune (leaving the receiver severely alone as before) and hunt this point with the new wavemeter. Let us say we find it at 160 degrees.

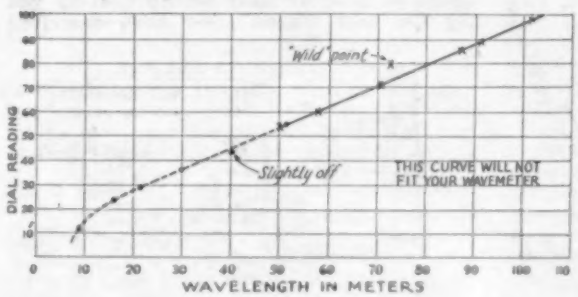


FIG. 3

Calibration Curves For the New Wavemeter
Heavy part of curve taken from old wavemeter as explained in this article. Dashed part gotten by extending downward with the aid of second harmonics as also explained in this article.

Table A

Fundamental	Second Harmonic or Half Wave	Reading for half wave on New wavemeter
Old Wavemeter		
Coil No. 2		
204 Meters	*102 Meters	96°
185 Meters	* 91.5 Meters	87°
174 Meters	* 87 Meters	88°
Coil No. 1		
150 Meters	75 Meters	80°
142 Meters	71 Meters	70°
116 Meters	58 Meters	59°
101 Meters	50.5 Meters	53°

Table B

Extending curve of new wavemeter down below 50 Meters.

Reading at oscillator wave	Wavelength from heavy curve Fig. 3.	2nd Harmonic	Scale Reading second Harmonic
98°	105 Meters	52.5 Meters	55°
78°	81 Meters	40.5 Meters	44°
	Wavelength from first part of light curve.		
61°	60 Meters	30 Meters	23°
46°	44 Meters	22 Meters	29°
38°	32.5 Meters	16.25 Meters	23°
25°	18.5 Meters	9.25 Meters	12°

Leading the Standard

So far as we have had the original wavemeter to work from and the going has been rather easy. Let us say that the old wavemeter stopped at 100 meters. By this time we have gotten all of the points shown in Table A. From this we can plot the heavy part of the curve shown in Figure 3. This is all right as far as it goes, but it does not go far enough. We must invent some way of extending the curve downward.

The simplest thing is to use the same scheme of half waves that was used in finding the second column of readings on the old wavemeter. We go at it in just the same way.

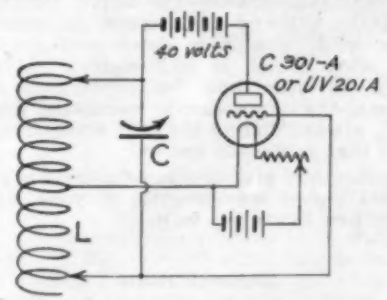


FIG. 4

Oscillator For Calibration Work
Use plenty of plate voltage to secure strong harmonics.
C—Variable condenser with extension control such as a 10" stick taped to the knob. Capacity may be anything that comes handy but had better not be over 500 uufds for ease in tuning.
L—Almost any small helix. Must be tapped at every turn. For shortest waves use 8 turns spaced on 2" tube.

First set the oscillator at a wavelength

near 100 meters. Find this wave with the new wavemeter, *having taken the old one entirely away.* You should find this value near the top of the scale on the new wavemeter. Supposing that you find the click with the new wavemeter set at 98. From the curve we have just drawn this wavelength is 105 meters. Now run the new wavemeter (leaving the receiving set absolutely alone) until another click gives you the half wave, which very evidently is 52.5

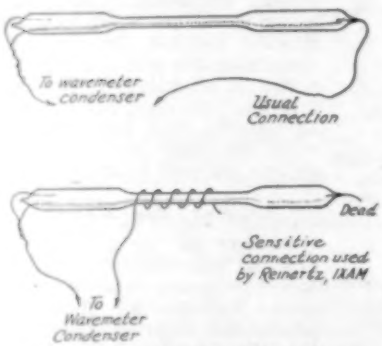


FIG. 5 USING NEON TUBE FROM "SPARK C" OR AIRCO "IGNITION GAGE"

meters. We now start making Table B. Next, by using the new wavemeter, set the receiver at some value near *80* meters, read the exact value from the curve (it turns out to be 81) and again leave the receiver alone while you drop down and get the half wave which is 40.5 meters. It can easily be seen how by continuing this process, the curve can be continued downward, always finding the half wave of some point that is already known.

Incidentally also this same scheme is good on the higher wavelengths, if your wavemeter now has a gap in it.

General Hints

By all means get plenty of points, the more you have the more certain you are of the final curve. Take plenty of time to do the job and do it right or there will be trouble pretty soon afterward.

If your regular receiver will not oscillate at the waves given then rig up a plain Hartley oscillator as shown in Figure 4.

When using the wavemeter with a receiving set the "click" method is all you need. When you are using it with a transmitter a little vacuum tube may be used as explained on page 23 of the February issue and page 21 of the April issue. Suitable connections are shown in Figure 5.

Easy on the Questions

LOOK at *QST* first—write afterwards. Certainly at least 90% of all questions on 100-meter work were entirely unnecessary and should have never been asked.

The same thing goes for 20 to 80 meter work. In the July, August and September issues of *QST* we have been preparing you for the new waves. We have described

wavemeters, circuits and antennas. Read those articles carefully and don't write 'til you are *dead sure* that your question is not taken care of.

And when you do write remember the rules of the Information Service. If you still have not read them take a good look at them below.

The Information Service.

Rules Governing the A.R.R.L. Information Service

1—Before writing, search your files of *QST*. You will probably find the answer there.

2—Do not ask for comparisons between advertised products.

3—Be reasonable in the number and kind of questions you ask.

4—Put questions in the following form:

A—A *standard business size* (not freak correspondence size) stamped, self-addressed envelope must be enclosed.

B—Write with typewriter or ink on one side of the sheet only.

C—Make diagrams on separate sheet and fasten all sheets together.

D—Number each paragraph and put only one question in a paragraph.

E—Keep a copy of your letter and your diagrams.

F—Put your name and address on each sheet. *We can not spend time digging your address out of the callbook.*

G—Address all questions to Information Service, American Radio Relay League, 1045 Main Street, Hartford, Connecticut.

Some Suggestions to Variable Condenser Manufacturers

By H. F. Mason, Dept. Editor

SOME variable condensers, while splendidly made from a mechanical standpoint, are utterly worthless electrically. Other condensers are electrically fine, but mechanically poor. The probable reason for this situation is that few men have a good knowledge of both mechanical engineering and radio, and can fit the two together in the right proportion.

Three Kinds of "Straight Line" Condensers

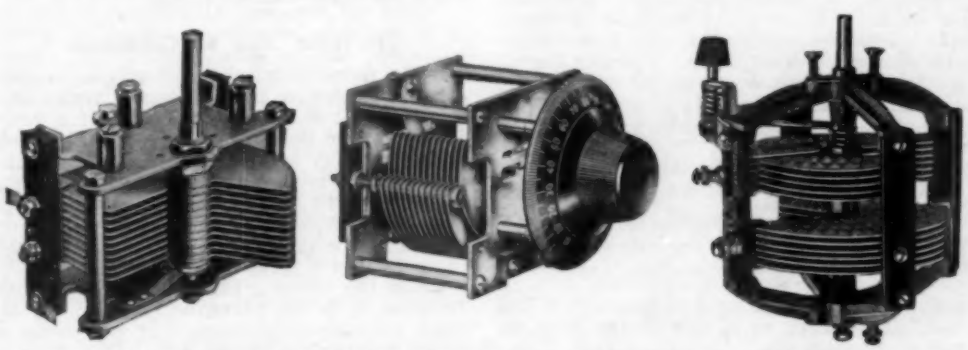
There seems to be misunderstanding regarding condensers reputed to have "straight line" calibrations. There are three distinct kinds of condensers, each of which has a straight line calibration. These are: 1, a condenser having a straight line *capacity* calibration; 2, a condenser having a straight line *wavelength* calibration; 3, a condenser having a straight line *frequency* calibration.

These three types, and the general shape of movable plates for each are shown in Figures 1-A, 1-B, and 1-C, respectively.

The first type has semi-circular movable plates. The capacity is proportional to the "effective area"; the "effective area" being that portion of the plates represented by the shaded area in Fig. 1-A, which changes with every change of the dial. Twice the dial setting will give twice the capacity, and so on. The *capacity* calibration curve will be a straight line except for a few degrees at the ends of the scale. Such a condenser is especially useful in laboratory work where the experimenter is concerned mostly with the capacity in the circuit. When used in conjunction wtih an inductance, the two acting as a tuned circuit, the wavelength scale will be crowded near the lower end and open at the high end. This may be a little inconvenient and so one of the following two types is getting to be more favored for use in a tuned circuit.

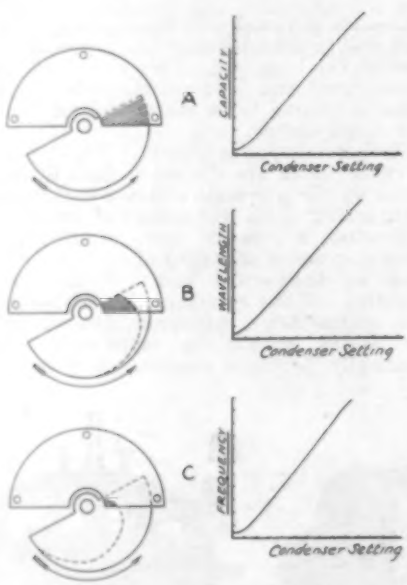
The second type is shown in Fig. 1-B The movable plates are shaped so that divisions on the wavelength scale will be a uniform distance apart. This will make the *wavelength* calibration a straight line; rectifying the above mentioned crowding of the wavelength scale at the lower end. While merely rounding off the entering edge of the movable plates helps somewhat, the shape of the plates should be calculated mathematically for best results. The movable plates should be carefully shaped so that the effective area varies as the square of the angle of rotation. Theoretically, the wavelength calibration would be a straight line only if the coil with which the condenser was used had zero distributed capacity. In practice the deviation from a straight line when used with a single layer or basket-wound coil is so slight that it may be disregarded. A far greater source of error that renders a condenser practically useless for wavemeter work is the poor shaping of the plates. This causes the calibration curve to have bumps in it and makes it impossible to draw a fair curve through several correctly measured and plotted points.

The third type, shown in Fig. 1-C, has rotary plates shaped to give a straight line *frequency* calibration. The plates are shaped similarly to those in Fig. 1-B, ex-



Some variable condensers, typical of the advances made in variable condenser design within the past year. Note how they conform to many of the suggestions in this article.

cept that more material is cut away. The main advantage of this type of condenser is that all stations will tune with the same sharpness, no matter where on the dial they are picked up. This type of condenser is also fine for the man who likes to talk in kilocycles instead of meters. Because it is the only kind of condenser that really



THREE DIFFERENT "STRAIGHT-LINE" CONDENSERS

FIG. 1

gives the operator a good perspective of the "air" it appears as if this is the kind we will eventually use.

While discussing various shapes of plates, no one seems to have thought of cutting away the inside edge of the stationary plates to get a certain law of increase; leaving the movable plates semi-circular and the shaft central. This is shown roughly in Fig. 2. It would appear that this construction would have advantages, considering that some condensers are built with the shaft eccentric for the sake of getting the right relation between the plates in the smallest possible space and resulting in a lopsided condenser.

Ratio of Maximum to Minimum Capacity

Many are not sure what advantages there are, if any, in the use of a condenser having a low minimum capacity, or a high ratio of maximum to minimum capacity. The answer is that there will be no difference in signal strength, but the wavelength range covered and the convenience of tuning will be influenced. This is explained as follows:

Most variable condensers are used for tuning purposes and will cover a certain range in wavelengths when used with a given coil. The upper wavelength limit is fixed by the size, number, shape, and spacing of the condenser plates. The lower wavelength with a given coil is determined by two things; namely, the minimum capacity of the condenser, and the distributed capacity of the coil. The minimum capacity of the condenser is the capacity remaining when the dial is set to zero.

A high minimum capacity in the condenser will greatly reduce the band of wavelengths available. Using a coil having a large distributed capacity has the same effect. That is why basket-wound coils or spaced-turn coils are used in amateur wave receivers; they have less distributed capacity than a tightly wound single layer coil and allow the covering of the wavelength band desired with a condenser having a lower maximum capacity. It is the *ratio* of maximum to minimum capacity in the coil-and-condenser combination with which we are really concerned and the minimum capacity in a circuit is greatly lowered by using the right kind of a coil.

The Best Size of Condenser

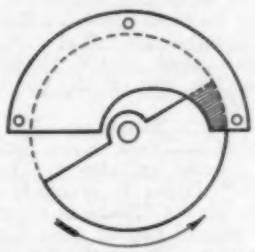
It is never advisable to use a larger variable condenser than necessary across the input circuit to a vacuum tube. If a condenser larger than about 500 μμfds. is used a decrease in signal strength will occur. If you must cover a large wavelength range, use a coil with low distributed capacity and a small variable condenser across it, rather than a coil with a great deal of distributed capacity and a large variable condenser.

From the above it can be understood how fruitless it is for manufacturers to try to build variable condensers that will cover a given wavelength range with other than a standard coil. There are two solutions for this difficulty. One is to make the condensers in several sizes, marking the maximum and minimum capacity on the box, let the builder wind his own coils, and encourage the use of a wavemeter, measuring the wavelength of the combination and getting the right number of turns. *A still better idea would be for the manufacturers to specify exactly how to make coils that would cover definite wave bands when used with their various condensers.*

Condenser Resistance

The recent avalanche of "Low-Loss" condensers has brought with it many figures as to the resistance of the various condensers on the market. The usual method of stating the resistance of a condenser is to give the "equivalent series resistance"; which is the resistance that would allow the same current to flow if it were connected in series with a perfect condenser of the

same capacity. These measurements are usually made with 1,000-cycle current through the condenser because good radio frequency measurements are very hard to make. Even many of the 1,000-cycle measurements are evidently wrong or padded to make them sound fine. It is *not correct* to assume that there is a fixed relation between the 1,000-cycle measurements and



WHY NOT DO IT THIS WAY ?

FIG. 2

the resistance at radio frequencies, *hence it is not possible to compare the value of two differently constructed condensers at radio frequencies when audio frequency measurements are used as a basis of comparison.*

Insulation

The resistance is due chiefly to the absorption of energy by the dielectric, and to poor electrical contact between the metal parts of the condenser. The dielectric loss can be reduced by using an insulating material that is good at radio frequencies, placing it where the electrostatic field is not intense, and by reducing the quantity of material used.

The matter of reducing the dielectric loss by putting the solid insulating material where it will do the least harm requires explanation. Referring to Fig. 3A the imaginary lines of force between two condenser plates are shown. Where the lines are closest together the electrostatic field is the strongest, becoming weaker where the lines are separated farther. The field is most intense between the plates because that is the place where the parts connected to opposite terminals of the condenser are brought closest together.

If a block of solid insulation such as a piece of bakelite or hard rubber is now inserted between the plates, the electrostatic field will re-distribute itself as in Fig. 3B, increasing in intensity where there is insulating material, by a factor called the dielectric constant of the material. For instance if the solid insulating material has a dielectric constant of 5, there will be five times as many lines of force per square inch in the dielectric as in the air between the plates. This also means that the capacity per square inch of area of one plate will be five times as great where the lines of force pass through the solid material as in air.

In the same way that a sponge can be kept from absorbing water only by *keeping it out of the water*, a condenser can be kept from having excessive dielectric losses only by constructing it so that the solid insulating material is not in a strong electrostatic field. The ways of lessening the field strength through insulation are, first, by making the path from one terminal to the other through the insulating material much *longer* than the distance between the plates, second, by using an insulating material having a low dielectric constant, third, by making the cross-sectional area of the insulating material at right angles to the lines of force *as small as possible* without endangering the condenser mechanically. In addition, the insulating material should be one that inherently is a good insulator at radio frequencies.

The general conclusion from the above is that the condenser with insulating bushings has seen its day, for that type of construction does not yield itself to low-loss construction. Slender strips of insulating material such as are used in some of the condensers on the market represent the latest practice. Condensers with solid end plates of an insulating material can be made with low losses if the insulating material is something that is good at radio frequencies, the end plates are large so the distance between opposite electrodes is great, and the material is not too thick.

Aluminum and Brass

The resistance of a condenser, especially when used on short wave work, is in a great part due to the electrical connections between the supporting posts and the plates being poor. Aluminum plates *always* oxidize and the oxide is a good insulator. Some condensers have their plates fitted into grooved posts. If they are not loose to begin with, they soon will be, especially

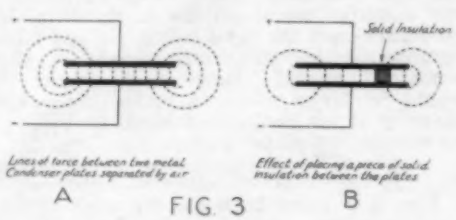

Solid Insulation
Lines of force between two metal Condenser plates separated by air
Effect of placing a piece of solid insulation between the plates
A
B

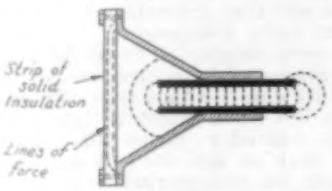
FIG. 3

when the metal of the plates and posts is not the same. Where ever there are two dissimilar metals in contact the electrolytic action encourages the formation of a high resistance film. Soldering the plates together and to their supports seems to be the best solution to this trouble, but even this does not entirely get around the diffi-

culty. Welding or brazing has been suggested, but we have not seen it applied practically.

Need of Standardization

Nowhere in the radio game is the need for standardization as great as in the location and size of mounting holes for variable condensers, couplers, and variometers. Inexperienced persons always have a hard time marking off on a panel and drilling holes a certain distance apart. When this distance must be measured in degrees of arc or 64ths of an inch, they despair entirely. Some manufacturers supply templates with their condensers. This is fine when they fit the condenser. Some of them do; some of them do not. As time goes on more manufacturers are making the shafts of their apparatus 1/4 inch in diam-



One way of reducing the number of lines of force thru the solid insulation is to make the insulation in the form of long slender strips

FIG. 4

eter. This is a step in the right direction, but it would be well for them to get together with the dial makers and decide on standard tolerances. At present some dials have to be driven on to their shafts while others wobble.

A Bad Mistake

The first variable condenser ever made had 23 plates and for some unknown reason ever after than manufacturers have stuck to the 23 plate idea. There is no reason for this misplaced standardization for no two manufacturers' version of the 23 plate condenser have the same maximum and minimum capacities; the things we are actually concerned about. How much better it would be for a maker to state the exact capacity of his product rather than to keep up the old "23 plate" idea.

Reducing Hand Capacity Effect

This is a point both for the user of the condenser and the manufacturer. It is generally recognized that the shaft and movable plates of a variable condenser should always be connected to the low potential or ground part of the circuit and that if this is done the hand capacity effect will be reduced. However, this is not an unvarying rule. Some condensers have their mounting screws connected to the stationary plates, thereby bringing the high potential part of the circuit *right to the front of the panel where it is not wanted.* If you have such a condenser and are not sure whether you have it connected so the hand capacity effect will be at a minimum, try reversing the connections to the condenser, tune in a weak station, and see if placing your hand near the dials makes more of a difference than before. The best practice is to entirely insulate the mounting screws or to connect them to the movable plates of the condenser. As far as possible, all metal parts connected to the stationary plates should be kept away from the end of the condenser next to the panel.

Bearings

Brass against brass never makes a good bearing. Sooner or later the bearing will "freeze up," unless it is made very loose in the first place. There is no good reason why steel should not be used for the shaft or the bearing. The exposed portion should be made rustproof in some fashion, if steel is used. The importance of good bearings is becoming more prominent because of the fine tuning adjustments necessary with the present day low-loss circuits. A condenser with loose bearings is always a failure when it comes to trying to adjust the dial to a small fraction of a degree.

While speaking of bearings, a simple and lasting method of adjusting the friction would be welcome as many persons have their own preferences in the matter and would like to adjust the friction so the turning effort required on all of the dials in their set would be the same.

Connections

Many condensers are fine until we start connecting wires to them. Most other pieces of radio equipment have real binding posts on them for connections. Why not variable condensers?

There has always been disputation as to whether it is better to connect the movable plates to the binding post by a flexible connection (or pigtail), or whether it is better to depend on the bearing for connection to the movable part. There are

GOOD AND POOR "PIGTAILED" CONNECTIONS TO MOVABLE PLATES

FIG. 5

arguments on both sides. The pigtailed connection is *unquestionably* better electrically because it allows the use of soldered connections thruout the condenser. However, a stop is required to limit the movement of the rotary plates so there will be no danger of twisting the pigtail off and

this is a disadvantage. It is very easy to run the condenser against the stop, accidentally or otherwise, and slip the dial, destroying the calibration if the condenser is used in a calibrated circuit. Leaving off the pigtail and stop simplifies the construction but nothing is gained. The poor electrical contact through the film of grease or oil in the bearing is sure to cause loud scratches and rumbles in the phones every time the dial is turned. If the oil is wiped out of the bearing, then the bearing will wear and the shaft will not turn well. After all, a soldered pigtail connection is best.

Flexible connections to shafts should always be insulated by placing a piece of sleeving over the conductor, otherwise the turns may touch each other or wires connected to other parts of the circuit and cause a racket in the phones. The best shape for the flexible connection is in the form of a small spiral spring of three or four turns of thin soft copper or phosphor bronze about 3/16 inch wide, insulated by slipping a piece of flat silk shoe-string over it. Stops should always be provided where pigtails are used.

The First Hoosier State Convention

WELL, fellows, July 17th, 18th and 19th, 1924, will go down as historical dates for the amateurs of the State of Indiana. Our A.R.R.L. Convention held at the Hotel Anthony, Fort Wayne, is over and what a grand old time was had by every one.

The visit to the plant of the General Electric Company was well worth the trip, eh, Hams? We certainly know more about transformers, their windings and WINDERS. And those visits to ham stations where some slept five in a bed. Oh the joy of hamfesting together! The trip to Tri Lake with the fried chicken dinner at the end; what's the use my mouth is still watering fo'moh.

Our scheduled talks took place with much more promptness than is usually the case, and the paper of Mr. R. H. Chadwick, of the General Electric Co., on Radio Transformers was very ably read and discussed by Mr. E. A. Wagner also of the General Electric Co. in the absence of Mr. Chadwick.

Our good friend M. B. West, of Lima, Ohio, gave an interesting talk on the Radio Equipment aboard the "WNP". Fred Schenll's "Hay-wire" low loss short wave receiver was on exhibition and he gave valuable information to the gang.

Over 100 Y.L.'s and O.M.'s sat down at the banquet and the "gang" enjoyed the leadership of Harold Elliott of Detroit who demonstrated that he could play anything on a tin whistle. At the Head Table sat Central Division Director Darr, Manager Mathews and A.D.M. Angus; also Traffic Manager Schnell and A.R.R.L. Treasurer A. A. Hebert.

Do you know fellows, that Indiana is the first State to promise that it would send one of its representative amateurs to Paris, France, in April, 1925, when the first meeting of the International Amateur Radio Union takes place. Division Manager Mathews promised that a total of four men would also attend from the Central Division. As Briggs would say: "Aint it a Grand and Glorious Feeling."

The Convention closed with the initiation into the R.O.W.H., after which every one left for home satisfied and happy at the very successful outcome of the first Indiana State A.R.R.L. Convention. Delegations were present from Detroit, Mich., Chicago, Ills., and Dayton, Ohio; besides all the Indiana "Gangs".

Great credit is due to Mr. E. R. Coolidge, "ec" of 9AKO and A. H. Barnett, "ah" of 9AKO as well as their committee for the success of it all.

The Indianapolis delegation made a bid for the Convention for 1925, and we are looking forward for that next one.

—*A.A.H.*

A Sketch by Dickson, 1ANV, of the Worcester Cast that put on the Wouff-Hong Initiation at the Springfield (Mass.) Convention in March. A. H. Boyden of Worcester was Coach and Lee Bates, 1GY, Manager.

WNP Works 1BVR

THE long silence from WNP was broken on July 19 when 1BVR answered a CQ from Mix at 3:09 A.M. 1BVR worked Mix until 3:25 A.M., taking the following message:

ALL WELL WILL BE BACK SOON CAN HEAR SEVERAL STATIONS TONIGHT AS AURORA EFFECTS ARE NOT BAD TELL THE BOYS TO KEEP A SHARP LOOKOUT FOR MY SIGNALS AS WE WILL HAVE SOME IMPORTANT NEWS SOON IF OK LET ME KNOW QUICK CANT HOLD YOU YOU LONG.

2CYQ, 8BKM and C. E. Warren of Woodmere, L. I., also heard the exchange of communication.

The Bowdoin has started for home, according to the above message, and Mix

— Homeward Bound —

urges a sharp lookout for his signals as he has important messages on his hook. We must clear them for him! No one can tell on what night or at what time he may work WNP, and we urge the absolute adherence to the program outlined in the July, 1923, issue of *QST*, with respect to secrecy of messages and our duty to MacMillan and the North American Newspaper Alliance. We don't want any more leaks of which we have been guilty in the past and any O.R.S. or any official of the Traffic Department found lacking in this respect will have his appointment suspended for some time. Watch your step, and when in doubt ask for information from A.R.R.L. Headquarters, rather than take a chance.

9EJI reports hearing WNP on July 9th, but unable to copy because of QSS and QRZ. 9BEP reports WNP on July 7th. Nothing else was reported but you can count on hearing WNP within a very short time as the Bowdoin will be close to home. She is expected to dock at Wiscasset, Maine, in early September—we'd like to see a gang turn out to welcome her home. What sa?

Backing Us Up

ON THE heels of Mr. McLaughlin's "One-Control Neutrodyne" article, which appeared on page 9 of the August issue of *QST*, we find the following in the *Scientific American* under the heading "Can the Neutrodyne Be Improved."

"While admitting the numerous advantages of the neutrodyne, especially as a basic circuit, it is fair to consider what can still be done to this circuit to make it still better in the future. And no one is better qualified to pass an opinion on this question than Prof. Hazeltine himself, the designer of the neutrodyne circuit who writes in part as follows: "Probably almost everyone who has operated a neutrodyne receiver has noticed that the three dials read nearly alike for each wave length setting and has had the idea that these three adjustments might be made simultaneously by gearing the dials together, or better, by mounting the rotors of the three condensers on the same shaft. If this could be successfully accomplished, tuning would be vastly simplified, and it would be impossible to pass through a station which was broadcasting without hearing it."

It is certainly pleasant to know that we were lending encouragement to an idea that was already in the mind of the inventor.

Morrell Contest Extended

ON page 26 of our issue of December of last year we announced that Mr. Harry H. Morrell, 1CKY of New Haven, Conn., had very kindly offered to put up a 300 ampere-hour 6-volt Edison A-battery as a prize for the best single aid to amateur operation developed between then and June 1, 1924.

Only two entries were received, one from Canadian 3ADN, covering a battery charger made from a telephone magneto, and one from A. E. Kleinfelder, West Hoboken, N.J., being a honeycomb-loader mounting having a shorting switch which is opened when the coil is shoved in. Mr. Morrell accordingly has decided to extend the time of the competition until June 1, 1925, the two entries in hand to continue to stand as entered, of course.

This contest deserves more entrants and more consideration. 300-A.H. Edisons don't grow on bushes. Take a look at December *QST* and learn how simple it is. This is a development contest, and the idea is to recognize that contribution which has been most helpful to the amateur game, whether apparatus or whatnot. Even if you haven't contributed anything especially yourself, you can enter the name of a friend or favorite author and direct the attention of the judges to his accomplishment. Entries should be addressed to A.R.R.L. Headquarters and should be plainly marked "Morrell Prize" on both letter and envelope.

Now who's going to give Messrs. Thomson and Kleinfelder a run for that battery?

Experimenters Section Report

THERE is no formality about the Experimenter's Section; we believe that radio experimenters do not care for complicated organization and therefore we will organize just as little as possible. This at once removes the need for monthly reports and extensive correspondence.

Membership in the Section is open to anyone interested in radio experimentation in company with others.

It is not necessary to have a radio laboratory, most of the work can be done with the equipment of an ordinary amateur station plus the willingness to stick to it.

Joining the Section

The business of joining the section is extremely simple—just address a request to *Experimenter's Section, A.R.R.L., 1045 Main Street, Hartford, Conn.*

The Service of the Section

The Experimenter's Section offers the following services:

A List of men who are interested in your problem.

A list of problems that are in need of work at present.

Outlines suggesting the best way of attacking your problem.

All of these are kept up to date and are available on request of those who have enrolled their names in the Section.

Laboratory Sheets

Several additional laboratory sheets have been made out. They will be mimeographed and sent to the members who signed up for them as soon as the September *QST* copy can be gotten out of the way.

New Numbers for the Experiments

It has been necessary to re-number the experiments. The corrected list is given below, please take note and use the new numbers in your correspondence.

ANTENNA CIRCUIT

A1—BEST OPERATING WAVELENGTH FOR SENDING ANTENNAS.
A2—Counterpoises—height, size, shape, wire spacing, insulation.
A3—Tests of antenna insulators, electrical and mechanical.
A4—Development of a good lightning switch.
A5—Imperfect dielectric in field of antenna and counterpoise.
A6—Grounds vs. counterpoise for C.W. reception.
A7—LOOP TRANSMISSION AND RECEPTION.
A8—Beverage wires at waves below 100 meters.
A9—Underground antennas.

RECEIVING SETS

R1—The super-heterodyne for C.W. below 200 meters.
R2—Improvement of the standard regenerative set.
R3—TESTS OF RECEIVING INDUCTANCES, SIZE AND SPACING OF WIRE, METHOD OF WINDING, SPACING, INSULATION, EFFECT OF "DOPE."
R4—COMPARISON OF HEADSETS (FOR SENSITIVITY ESPECIALLY).
R5—A really good R.F. amplifier for waves below 200 meters.
R6—AUDIO amplifiers—quiet and with good peak at 1000 cycles.
R7—Comparison of American and Foreign tubes that you have.
R8—Comparison of American and Foreign apparatus that you have.
R9—RECEPTION OF C.W. SETS AT HALF AND DOUBLE WAVELENGTH.
R10—EFFECT OF CHANGING LC RATIO IN TUNER SECONDARY (See No. 2).

TRANSMITTING SETS

T1—HOW CAN WE DO AWAY WITH KEY THUMPS AND SURGES THAT BLOW TUBES AND INTERFERE WITH BROADCAST RECEPTION?
T2—Keying methods—best location of the key.
T3—CAUSE AND REMEDY OF THE UNSTEADY WAVE.
T4—KEYING MOTOR-GENERATOR SETS AND RECTIFIERS WITH BIG FILTERS.
T5—Development of a GOOD wavechanger.
T6—Efficiency of various rectifiers.
T7—TANSMITTING INDUCTANCES, compare helix with pancake, flat strip with edgewise strip and with tubing also litz. (URGENT).
T8—Comparison of plate supplies—effect on range with same input.
T9—Does it pay to use a good grid condenser—since a leak is used?
T10—Comparison of American and Foreign tubes that you have.
T11—HARMONICS FROM TUBE TRANSMITTERS (URGENT).
T12—Tyzzer signal (See *QST* for October, 1923, page 15).
T13—MERCURY ARCS.
T14—Loop Transmitters.
T15—PORTABLE TRANSMITTERS.
T16—AMATEUR ARCS (URGENT).
T17—HOW CAN D.C. TONE BE KEPT UP BELOW 100 METERS?
T18—FILTERING "SINK" RECTIFIERS SO LOCAL "MUSH" IS CUT OUT (URGENT).
T19—Transmitting circuits.

GENERAL

G1—Wired Wireless (i.e. Carrier frequency or guided radio).
G2—Tests of insulation at radio frequencies.
G3—Effect of weather, barometer and moon on radio conditions.
G4—Static elimination or reduction.
G5—Distant Control.
G6—Break-in systems.
G7—Best size for sending antennas.
G8—WORKING SENDING ANTENNAS AT A HAMONIC.
G9—Resonance wave coils.

SPECIAL PROBLEMS

Other problems of uncertain value, or of limited interest are classified as "special" and are handled by personal correspondence. If they develop favorably they are transferred to one of the classes given above.

NEW PROBLEMS

The above list is not complete—do not hesitate to suggest additions, particularly if you are interested in the new problem you suggest.

Quartz Crystal

Several laboratories are working with the oscillating quartz crystal which was first described on page 30 of our July issue.

So far the operation has been pretty satisfactory above 200 meters. In that region crystals can be made to produce an output of 5 watts. Making a more nearly correct statement tubes controlled by crystals can be made to give an output of

about 5 watts when working in that region. This can be amplified, of course. In the region below 200 meters there has been quite a bit of trouble, the crystals frequently exploding during the operation. The reason for this can be seen by looking at Fig. 5 on page 33 in the July issue and noticing that the crystal must be made thinner as the wavelength is made shorter.

Possibly this may be overcome in some fashion later.

Portable Transmitters

The following letter refreshes a problem that has been too much neglected.

Box 61 Paxton, Ills.

Experimenters Section, A. R. R. L.

Dear OM:

Since my work with this outfit keeps me traveling nine months out of the year, I'm turning to your department for some dope on portable receivers and transmitters. I have about the same problem as Mr. Jakosky mentioned in the July *QST*. A portable outfit weighing less than fifty pounds. Any names of members working on this problem or dope you may have at hand will be greatly appreciated I'm sure.

Best 73's

M. L. Brown, Member, A. R. R. L.

Will not someone make it a definite job to work up a satisfactory portable transmitter and receiver? We have before suggested some things about portable transmitters but the response has not been anything like as good as on some other problems.

Correspondence

It has become absolutely necessary to insist that all correspondence be addressed exactly as requested above and a stamped business envelope be supplied with each letter, the return address being plainly written thereon. This is done to secure correct addresses and to save postage.

It is necessary for us to put approximately ten days into the making of *QST* each month. During that time we simply *cannot handle correspondence* and of necessity some letters will be delayed. We realize that this condition is not satisfactory but please do not make it worse by bombarding us with "follow-up" letters.

Corrections

Through an oversight the battery symbols mentioned on page 35 of the July issue

The one on the right is approved by the A.I.E.E.

were not properly designated. The cut is again reproduced herewith marked in accordance with the A.I.E.E. ruling.

Thru an unfortunate error at the publisher's end we quoted Ramsey's "Experimental Radio" at $1.60. We have since been informed that this price does not apply to the second edition, which is quoted at $2.00 postpaid. The address, etc., were correct.

Attention, Second District Members!

YOU are hereby notified that a meeting of the Board of Directors of the A.R.R.L. held on July 25, 1924, the By-Laws of the League were amended to create, effective September 1, 1924, a new division known as the Hudson Division, consisting of the following territory previously a portion of the Atlantic Division:

In the state of New York, the counties of Richmond, New York, Bronx, Kings, Queens, Nassau, Suffolk, Westchester, Rockland, Putnam, Orange, Ulster, Dutchess, Columbia, Greene, Albany, Rensselaer and Schenectady; in the state of New Jersey, the counties of Bergen, Passaic, Essex, Union, Middlesex, Monmouth, Hudson, and Ocean.

A director will be elected to represent the Hudson Division on the A.R.R.L. Board of Directors, at the elections to be held in November of this year. The attention of all League members residing in this territory is directed to the notice of such election and solicitation of nominations appearing elsewhere in this issue.

For the Board:

K. B. WARNER, Secretary

ELECTION NOTICE

To All A. R. R. L. Members Residing in the CENTRAL, HUDSON, NEW ENGLAND, NORTHWESTERN (including Alaska, ROANOKE, ROCKY MOUNTAIN and WEST GULF Divisions:

1. You are hereby notified that an election for a new A.R.R.L. Director, for a term of two years commencing at noon on January 1, 1925, is about to be held in each of the above Divisions, in accordance with the Constitution and By-Laws of the League. Your attention is invited to Sec. 1 of Article IV of the Constitution, providing for the government of A.R.R.L. affairs by a Board of Directors; Sec. 2 of Article IV, defining their eligibility, and By-Laws 12, 13 14 and 15, providing for their nomination and election.

2. Nomination petitions are hereby

solicited. Ten or more A.R.R.L. members living in any Division have the privilege of nominating any member of the League in their Division as a candidate for Director. The following form for nominating is suggested:

(Place and date)

Executive Committee,
A.R.R.L. Headquarters,
Hartford, Conn.

Gentlemen:

We, the undersigned members of the A.R.R.L. residing in the_____ Division, hereby nominate_____ _____of _____ as a candidate for Director from this Division, for the election of November, 1924.

(Signatures)

The signers must be League members in good standing. The nominee must be a League member in good standing, a resident of that Division, and must be without commercial radio connections. His complete name and address should be given. All such petitions must be filed at the headquarters office of the League in Hartford, Conn., by noon of the first day of November, 1924. There is no limit on the number of petitions that may be filed.

3. The Directors at present representing the above Divisions are as follows:

Central.....C. E. Darr, 8ZZ, Detroit, Mich.
Hudson .....None
New England.....G. H. Pinney, 1CKP, So. Manchester, Conn.
Northwestern.....K. W. Weingarten, 7BG, Tacoma, Wash.
Roanoke.....W. T. Gravely, 3BZ, Danville, Va.
Rocky Mountain.....P. M. Segal, 9EEA, Denver, Colo.
West Gulf.....F. M. Corlett, 5ZC, Dallas, Tex.

4. The elections will take place during the month of November, on ballots which will be mailed from Headquarters in the first week of that month. The ballots for each Division will list the names of all eligible candidates nominated for the position by members residing in that Division. In the event there is but one eligible nominee from any Division, the Executive Committee will declare him elected without ballot and so notify all members of that Division.

5. The Constitution of the League is designed to insure popular and representative government. Members are urged to participate actively in the selection of their Director and to file nominating petitions immediately.

For the Board:
K. B. WARNER, Secretary.

Hartford, Conn., Aug. 1, 1924.

WWV Schedules

EVERY day there are fewer amateur and broadcast stations who do not know their sending wavelengths exactly. The reason for this is the "standard frequency transmissions" from station WWV at the Bureau fo Standards, Washington, D.C. This service is useful not only within the range of WWV but is being relayed to all parts of the United States.

The service costs nothing and is being widely used, particularly on the wavelengths below 300 meters. It is unfortunate that these short wave transmissions cannot be made more frequently but the work has fallen almost entirely on one man. It is hoped that the wavelengths will be extended downward and more stations added to the system soon.

The accuracy of these signals is better than 3/10 of 1%, much better than any wavemeter the average amateur will ever be able to build. Information on using the signals was given in the February, 1923, issue of the Radio Service Bulletin, also in *QST* at the following places. Page 28, July, 1923; page 47, May, 1923; page 36, March, 1924; page 20, April, 1924. The schedules are being published regularly in *QST*. Look for them in the index, they are always there, if we have received a new schedule from the Bureau. The schedules appear to be issued at irregular intervals, however.

Schedule of Frequencies in Kilocycles
(Approximate wave lengths in meters in parentheses)

Eastern standard time	Sept. 5	Sept. 22
11:00 to 11:08 PM	300 (1000)	550 (545)
11:12 to 11:20 PM	315 (952)	650 (461)
11:24 to 11:32 PM	345 (869)	750 (400)
11:36 to 11:44 PM	375 (800)	833 (360)
11:48 to 11:56 PM	425 (705)	1000 (300)
12:00 to 12:08 AM	500 (600)	1200 (250)
12:12 to 12:20 AM	600 (500)	1350 (222)
12:24 to 12:32 AM	666 (450)	1500 (200)

The Amateur DX Report Card

A Study of the International Fad That 8UX Started

By Howard S. Pyle, 8FT

THE majority of amateur DX report cards have many faults which indicate a lack of thought in laying them out. Now it is true that the American amateur is distinctly an individual and that he will be governed first of all by his individual ideas when designing a card. Still he should not neglect the fact that the card has a real purpose, and should try to make it fulfill that purpose.

What Goes on the Card

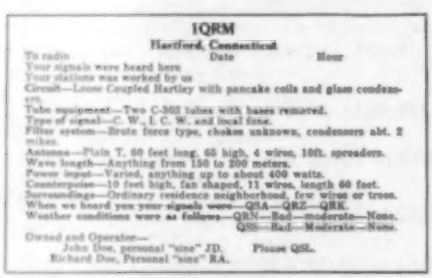
DX report cards are intended to convey certain definite information, to establish beyond a doubt that a station was heard or communicated with. It therefore follows that it will be necessary to give plainly—

1—The Call and address of station sending the card.

2—The time and date at which the other station was heard or worked (and perhaps a few words of the transmitted matter), possibly also the wavelength.

That is really the only essential information.

The writer's theory is that much of the information on cards is a waste of space. Take for instance antenna data. An amateur's antenna is usually governed entirely by his local surroundings—he cannot use anything else. Therefore what his brother amateur uses is of no interest in nine cases out of ten. If some really radically different scheme has been developed a brief description might be included but even that is doubtful—such material belongs in *QST* where it can help many more than if it


1QRM
Hartford, Connecticut
To radio _____ Date _____ Hour _____
Your signals were heard here
Your stations was worked by us
Circuit—Loose Coupled Hartley with pancake coils and glass condenser.
Tube equipment—Two C-302 tubes with bases removed.
Type of signal—C. W., I. C. W. and local fone.
Filter system—Brute force type, choken unknown, condensers abt. 2 mikes.
Antenna—Plain T, 60 feet long, 65 high, 4 wires, 10ft. spreaders.
Wave length—Anything from 150 to 200 meters.
Power input—Varied, anything up to about 400 watts.
Counterpoise—10 feet high, fan shaped, 11 wires, length 60 feet.
Surroundings—Ordinary residence neighborhood, few wires or trees.
When we heard you your signals were—QSA—QRZ—QRK.
Weather conditions were as follows—QRN—Bad—moderate—None.
QSS—Bad—Moderate—None.
Owned and Operate—
John Doe, personal "sine" JD. Please QSL.
Richard Doe, Personal "sine" RA.

"—much of the information on cards is a waste of space".

were on a card. After that the card can say "Special antenna—see p. 732, *QST*, June, 1924."

An argument can easily be started between amateurs as to the usefulness of information on the receiver and transmitter. Again the writer is of the opinion that a few words are enough. What more is needed than—"Hartley circuit, 60 watts input, 1½ amps. antenna current" . . . "Reinartz receiver, one stage A.F."?

Even this is too much for the experimental amateur, who is always changing

RADIO 8 DAG
2349 KROGER AVE. CINCINNATI, OHIO
TRANSMITTER
RECEIVER
Radio
Date
Auditory Receptor
QSO
QSW
QSM
Glad to QSR
73

"—It is advisable to leave blank spaces".

his station, increasing his input, shifting receivers, changing tubes. For this class (which includes most of us) it is advisable to leave blank spaces such as—"————Circuit————watts input————antenna amperes" and "————Receiver————steps R.F.————steps A.F." This will save much time otherwise wasted in crossing out old information—and if many cards are mailed daily time is important.

Size of Letters

It is customary to put the station call on the card in letters that vary from those an inch high to great flaring ones taking up the whole surface of the card. The reason for the big letters is that the designer wants the card to stand out prominently when tacked on a station wall—even when the wall is photographed and reproduced in the pages of a magazine. This is desirable but the letters should not run into the writing space for printer's ink is greasy and hard to write over.

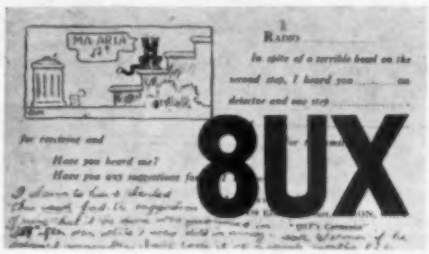
The Colors

Right here an important point comes in. The large call letters will frequently not photograph well because the color is wrong. Red and black photograph well, showing dead black in a photograph. A *deep* green or *strong* purple shows up next best but pale colors, particularly light blue, fade right into the background as if they were white. In most cases they can not even

be seen on the plate—much less the finished magazine picture. (Of course that is not the case if the photographer used a panchromatic plate and a K3 filter but that isn't done very often.—Tech. Ed.)

DX Wall Paper

Just for his own satisfaction the writer would like to ask "Why plaster the station



The card of 8UX who started the whole business.

walls with report cards?" It does not appear to be a really good stunt. The appearance of the station walls would be improved if fewer cards were used—say one from each foreign country, the most attractive one from each state—and perhaps a few especially interesting ones in addition.

The Near-funny Card

A growing number of stations exert all efforts to cover the entire card with collections of so-called humorous remarks. There are actual born humorists in the world but judging from the cards there are surprisingly few in the amateur fraternity while the efforts of the would-be's are rather disgusting. Avoid cheapening your card by a display of vaudeville humor.

The Showy Card

Then we have the young fellow who has a burning desire for elaboration. He uses two—three—five colors and spectacular arrangements and whorls and flourishes. To do such things successfully is the work of an artist. If you have talent, and expense means nothing, then it is possible to make an attractive card, but don't fool

"An attractive card—"

yourself into thinking that it only takes colors and curly-cues. That is the way to make yourself and your station ridiculous to the fraternity.

Cost

To most of us cost is a big item. A dollar saved on DX cards brings "the other bottle" that much closer. Several little economies may be practiced.

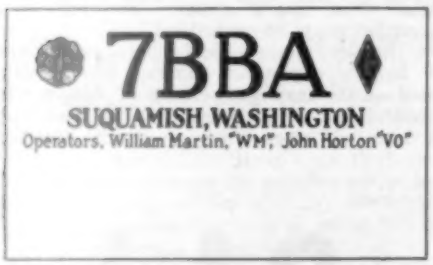
In the first place specify plain cards and not fancy, expensive, ones. Government postal cards may be bought at $10.00 per thousand but it is possible to spread this out over a longer time by purchasing un-

Colors as they show when photographed with ORDINARY plate.
Top card—Red letters, light blue border.
Middle card—Blue letters, red border.
Bottom card—Light green letters, light blue border.
All cards are on the same pattern but some colors do not photograph. Notice that the small lettering in black has come out o.k. in all three cards.

stamped cards instead and buying stamps a few at a time as they are needed. If the cards are not stamped it costs less to throw away the unused ones when the station must be moved.

A further economy is to use cards printed in one color only. While perhaps not as attractive as multi-color cards, they convey the message every bit as well and, if they are printed in dead black, will show up excellently on the wall or in a photo.

Still more saving may be effected by ordering a thousand cards instead of giving small repeat orders to your printer. It is



"—dead black will show up excellently."

cheaper for him to run thru a thousand at one time than to set type half a dozen times for as many small batches.

Think it Over

Perhaps the whole thing can be summed up by suggesting a little careful thought on the matter of station cards. Take a little time and see if you can't evolve a DX card that will be a credit to your station. I thank you.

Standard Frequency Stations

AS a result of measurements by the Bureau of Standards upon the transmitted waves of a limited number of radio transmitting stations, data are given in each month's Radio Service Bulletin on such of these stations as have been found to manitain a sufficiently constant frequency to be useful as frequency standards. A new station, WBZ, is included in this month's list. There may be other stations maintaining their frequency just as constant as these, but these are the only ones which reached the degree of constancy shown among the stations upon whose frequencies measurements were made in the bureau's laboratory. There is, of course, no guaranty that the stations named below will maintain the constancy shown. As a means of maintaining constant frequency the high-power low-frequency alternator stations listed below have speed regulators. Most of the broadcasting stations listed use frequency indicators (one-point wavemeters) and maintain a maximum deflection of the instrument on the frequency indicator throughout the transmission. These broadcasting stations with rare exceptions, vary not more than 2 kilocycles from the assigned frequency. The transmitted frequencies from these stations can be utilized for standardizing wavemeters and other apparatus by the procedure given in Bureau of Standards Letter Circular No. 92. "Radio Signals of Standard Frequencies and Their Utilization." A copy of that letter circular can be obtained by a person having actual use for it upon application to the Bureau of Standards, Washington, D.C.

Station	Location	Assigned frequency (kilocycles)	No. of times measured in 1923-24	Average deviation from assigned frequency since earliest measurements
NSS	Annapolis, Md.	17.50	81	0.2
WGG	Tuckerton, No. 1 N.J.	18.85	100	.2
WII	New Brunswick, N.J.	22.04	82	.3
WSO	Marion, Mass.	25.80	90	.3
WWJ	Detroit, Mich.	580	41	.1
WCAP	Washington, D.C.	640	56	.1
WRC	Washington, D.C.	640	40	.1
WSB	Atlanta, Ga.	700	52	.1
WGY	Schenectady, N.Y.	790	89	.2
WBZ	Springfield, Mass.	890	9	.0
KDKA	E. Pittsb'gh, Pa.	920	114	.1

Western Pennsylvania Get-Together

THE Western Pennsylvonia hams held a real "fest" at 8ZD's home in Wilkinsburg on June 28th. About seventy-five fellows from that district registered and from all reports the gathering was a huge success, in spite of the fact that one of the worst electrical and rain storms of the season was raging all night long. It takes more than a storm to keep the gang away.

The Madison Gang Cuts Loose With a Picnic

THE Madison Amateur's Radio Club put on a picnic at Madison, Wisconsin, on July 20th which proved to be the event of the season. It was attended by amateurs all over the central part of the state and delegations from Appleton, Menasha and Beloit and Milwaukee responded. A trip through WHA was made under the guidance of OXM, Mr. Miller, Chief Operator. The gang was then escorted to the home of 9DZV, R. D. Lighty, C.M. of Madison, where the picnic was staged in open air. Due to a storm the lectures scheduled for the evening had to be postponed but the Madison boys are to be given credit for the success of the affair, especially for the hard work of the secretary of the club, Mr. O. C. Austin.

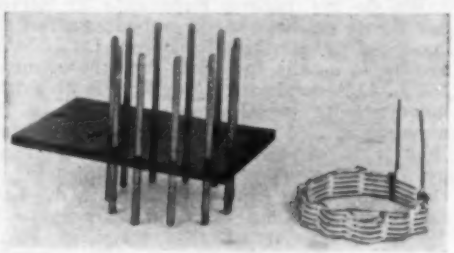
The Basket-Weave Coil

Losses and wire sizes in the Lorenz-type Winding

By Greenleaf W. Pickard*

EVER since *QST* began its excellent series of articles on low loss tuners, I have feared lest some brash member of our fraternity would start a basket weave zero loss coil of #0000 wire, and fracture his vocabulary in the attempt. It is obvious that very big wire indeed could be used with advantage if the coil was a foot or two in diameter, and the turns were spaced an inch or two apart. But if we confine our attention to coils only three or four inches in diameter, wound with double cotton covered magnet wire in the Lorenz or basket-weave manner, there is a definite limit to the size of wire which should be used.

To determine this, I recently had constructed a number of 100 microhenry coils, wound on a ring of 11 pins in a circle 3.25 inches in diameter, slipped off the pins and held together with lashings of thread, no dope or varnish being used. These coils, which were wound with magnet wire ranging from No. 12 to No. 26, were measured for resistance at several radio frequencies. As there were three variables—size of wire, frequency and resistance—a complete plot of their interrelation would be a solid or three-dimensional graph. In the enclosed sketch, this solid graph is sufficiently indicated by four sections at 500, 1000, 1500 and 2000 kilocycles, and it is immediately apparent that the best gauge of wire for this particular size and form of coil lies between No. 16 and No. 18. It is also apparent that the use of a materially larger wire will impale the unfortunate constructor on the sharp Ohmic Peaks at the right of my sketch.

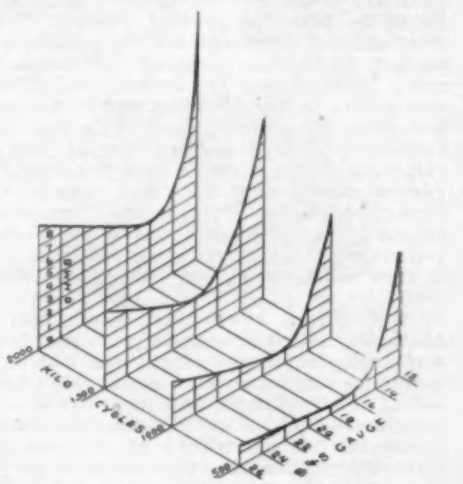


A Form Used in Winding Lorenz Coils and A Basket Coil of the Lorenz Type.

The coil is wound on the pins of the form, tied with thread and removed. An odd number of pins must always be used.

Courtesy F. H. Schnell.

It is hardly necessary to add that the sharp increase in resistance with increasing size of wire is due to eddy-current loss; the field around each wire cuts the copper of adjacent turns, so that above a certain size of wire, the more copper one puts into the coil, the higher its resistance at radio frequencies. The steepness of the curves to the right is due to the fact that eddy-current loss increases as the square of the wire diameter, while the gentle slope to the left is the sum of the increasing high frequency resistance of the diminishing conductor, and the decreasing eddy-current loss. What may be done by stranding the conductor is another and a more complicated story, which need not be here told, for as yet no stranded wire has been developed that is effective above 1000 kilocycles.



How the Resistances of Basket Coils Vary.

All the coils are wound with double cotton covered wire on an 11 pin form to an inductance of 100 microhenrys, the pins being set on a 3¼" circle.

Note that No. 18 D.C.C. seems best at 500 kilocycles (600 meters) while No. 16 D.C.C. seems to be slightly better at 2,000 kilocycles (150 meters). This is not a large change and it seems that we will be fairly safe in using either of these sizes in all of our amateur and broadcast work.

Remember these curves are for BASKET WOUND coils, they do not fit the plain spaced coil—that is another story.

*Chief engineer, Wireless Specialty Apparatus Co., Inventor of the crystal detector.

A.R.R.L. Endorses Esperanto

AFTER a two-year's survey of the international auxiliary language situation the American Radio Relay League, subject to the qualification herein set forth, has decided in favor of Esperanto as its official international language, and it recommends that language to its membership.

The subject of an I.A.L. (international auxiliary language) for radio is intimately bound up with the general question of an international language for all purposes, a subject which has occupied the minds of many brilliant men for generations. There was a time in our consideration of the subject when it was not clear to us that this connection existed and we fancied that as radio people we were disconnected from the general trend of I.A.L. development and free to examine the various "competing language projects" much as a prospective purchaser might examine several tools with a view of selecting one for a particular job. As we progressed in our knowledge of the subject, however, it became unmistakeable that this concept was erroneous, and that the degree of success which we amateurs may experience in the use of any I.A.L. is indeed dependent upon the general progress of this most important movement.

As just one illustration of this point we have only to consider that while those few amateurs who find themselves thrust into international relations because of their far-reaching signals may readily enough adopt and master some particular I.A.L. that seems worthy to them, the great majority of us will not find our radio activities alone of enough moment to spur us to the effort; such is human nature. Yet we need this thing, just as all the world needs it. Knowing ourselves as we do, we have to admit that most of us will fail to make the necessary slight effort until the whole world takes up the idea, until some great agency sponsored by the leading nations of the earth gives attention to the I.A.L. matter and causes it to be adopted and put to work all over the civilized globe. This in fact is exactly the goal of the I.A.L. movement—to demonstrate by practice such immense benefits in the plan that the governments of the world will be moved to recognition and action, wherein the I.A.L. will become as much a part of one's ordinary education as the mastering of one's native tongue, and as necessary. Then we will have to know it, or be engulfed by the tide of progress. Thus it may be seen that the future of radio in the I.A.L. is directly a part of the general movement.

This being the case, it appears to us that it is the duty of everyone who will benefit by an I.A.L. to lend his aid to the progress of the general cause. To do otherwise would only delay the day when the I.L. may become of greatest service to any of us.

It was with this attitude of mind that we approached the final stages of our examination into the subject. The chief of the auxiliary languages is Esperanto, having by far the greatest number of followers. Indeed it is a practical, living language, with an extensive literature and hundreds of thousands of users all over the world. There are other "competing" languages, for the most part based upon Esperanto as improvements or reforms thereof. We have found much that we like and much that we believe to be good about some of these "improved Esperantos," but after a careful survey of the situation we have become firmly convinced that the time is not propitious to discuss improvements and continual changes in the I.L., because the general success of the I.L. movement is bound up with the advancement of the idea to proportions where the governments of the world will accept it. In fact it is apparent to us that it is nothing short of destructive to the success of the whole movement for the advocates of I.A.L. to split into camps and attempt to shout the merits of their particular project and to decry the language of the other. The time will come when changes and improvements can be made—when an international tribunal assumes charge of the I.L. In the meantime controversies only delay the day of eventual success.

We do not regard Esperanto as perfect nor do we believe that it embodies all of the good points contained in any I.A.L. We are by no means sure that it is the eventual I.A.L. Its dominating position in the field, however, its position as a leader in the movement, and most particularly the fact that it is already in actual practical use by a number of people many times larger than all other projects combined, have caused us to lend our endorsement to it. To do otherwise at this stage in I.A.L. history would only retard the ultimate success of the whole movement, regardless of the merits of any of the other proposed auxiliary languages.

In thus adopting and recommending Esperanto, the American Radio Relay League wishes it to be understood clearly that it does not regard that language in its present form as necessarily the one which should eventually come unchanged into world-wide recognition, and that it stands ready to adopt such modification of Esperanto or whatever other language may eventually be agreed upon by an authorized international agency of the great nations of the world. We believe it is essential to

the eventual success of I.A.L. that some language of this kind become a world-wide vehicle of expression, after which authorized agencies can make such rectifications as then may seem desirable. We believe that our members may accept Esperanto in the expectation that it will be one of the factors taken into account in the formation of the eventual I.A.L., if not indeed the chief support thereof.

We have communicated on this subject with, we believe, all of the national amateur radio societies of the world. All of those which expressed an opinion in favor of any artificial language recommended Esperanto, for reasons directly akin to our own. We may know, then, that our amateur correspondents in other countries are of similar mind and in all probability will take similar action in the near future.

Esperanto societies exist in most of the large cities of this country, where classes in the language are conducted and where textbooks may be obtained. The language is extremely simple in its composition and may be learned in a remarkably short time. We earnestly commend it to our membership and suggest that all amateurs endeavor to become acquainted with it at their earliest opportunity. Lists of inexpensive textbooks, information on local Esperanto societies, etc., may be had by writing to the Esperanto Association of North America, 507 Pierce Building, Copley Square, Boston 17, Mass.

—*K.B.W.*

The Receiving Experimenter

CONDUCTED BY S. KRUSE, TECH. ED.

"Earth Wires"

5XAY says that "a one-hundred-foot heavy rubber-covered wire, buried a foot or more in the earth and used as a receiving aerial will reduce static and still enable the operator to receive DX stations very well. The end of the wire should be taped or put in a bottle full of wax or tar. After heavy rains, it may be necessary to dig the wire up and dry it out."

The Superdyne Grid Leak

We have had wails for help from quite a few makers of superdyne receivers because they didn't use a grid leak when they substituted a hard tube for the UV-200 shown in our original article.

The same remark applies to other tuners also, whenever using a hard tube it is a foregone conclusion that you will need a leak. If the diagram doesn't show it that simply means that the builder of the original tuner used a soft tube.

Daven Resistance Couplers

Those that prefer resistance coupling in audio and radio amplifiers will be interested in the Daven "resisto-coupler", a peculiarly neat device for carrying two cartridge resistances and a mica condenser The condenser clips fit the well known Micadon type 601 while the resistance clips take standard grid leaks and also the special Daven resistance which are supplied in 15 different values, ranging from 2,500 ohms to 10,000,000 ohms (10 megs.) They are also supplied in the form of a "resistor kit" containing one each of the 1, 2, 3, 5 and 7 megohm resistors.

Crescent Lavite Resistances

The Crescent "lavite" resistors have been mentioned before. They are now made in a completely non-inductive form that will dissipate 10 watts. This, with careful moisture proofing, makes the Crescent resistance the most rugged cartridge-type high resistance of which we know. It can be used in ordinary amplifiers, power amplifiers, and even in small sending sets. The Lavite resistance is made in 12,000, 48,000, 50,000 and 100,000 ohm standard units with other values available on special order.

Shorted Turns

In many of the modern windings (especially the basket weave) it is quite easy to have a short circuited turn. A tuner with this difficulty will simply be dead, the signals having no strength to them. Try a new coil if yours act this way.

The Augusta Case

*By P. C. Herault**

THIS article is written and intended as a review of work done on a very aggravating case of radio interference by power lines now existing in Augusta, Ga.

At this time it might be well to state that Augusta is probably the most peculiar city of its size in the country. In this place there is not a single amateur or broadcasting station of any description. All of the radio in Augusta must come from outside, necessitating sensitive and expensive broadcast receivers. The B.C.L's have formed themselves into a club of about one hundred or more and composed of the very best people in town.

Just before Christmas of 1923 the B.C.L's began to notice a "buzz" that was present all over town and especially bad in the West Side, where the best residential section is located, incidentally the expensive receivers. The "buzz" was attributed to amateurs and our 4th District Supervisor, Major Van Nostrand, was requested to investigate and take necessary steps to correct the disturbance. The Major's investigation disclosed the fact that the trouble was from distribution lines and not amateurs. At the Supervisor's request, I was asked to look over the situation and do what I could. A trip was made to Augusta during the latter part of February.

A general survey of the West Side was made, which disclosed the fact that in this section there is a steam generating plant, also two incoming 44,000-volt lines. From the plant there radiated the usual net work of 2300-volt distributing lines, also a 13,000-volt line that went over to the south side to serve industrial loads. This 13,000-volt line came down Central Avenue through the heart of the west side. Attached to this 13,000-volt line on Central Avenue were two transformers about one-half mile apart, that serve the local distribution in that particular section. The 13,000-volt line and the transformers were looked upon with suspicion by the "fans".

The first night was spent going to various sets to listen to the "buzz", in order to determine where it was the worst. Several cases of dead "B" batteries were fixed, but the conclusion reached was that in the section around Central Avenue, for a radius of a half mile or more, it was hard to say where the "buzz" was worst.

The next day a test for faulty 13,000-volt insulators was made without finding any defects. The 13,000-volt transformers were taken out of service and the results were not satisfactory; while the interference was decreased, it did not stop. The conclusion was that the 13,000-volt line and its transformers acted as carriers. Two 2300-volt circuits, known as the Summerville "A" and "B" circuits, were examined and, on taking these out of service, the interference stopped. A careful examination of these circuits visually developed nothing but a few tree grounds. The tree grounds were not causing the trouble. Further investigation revealed that there were not one but many disturbances affecting radio in Augusta. This conclusion was confirmed later by the blowing up of a cable in the downtown fire district, which is on the east side, relieving, partly, that section of town.

The blowing up of some transformers south of the Central Avenue section relieved, partly, that particular locality.

A Deforest 10-D set was called into service and an exploration of the Central Avenue section was undertaken. The results were anything but satisfactory, due to the fact that while the loop gave splendid compass action on the outside of town, in the affected area the loop was worthless, as it could be oriented 360 degrees and the intensity remained the same. The thought on this is that the interference not only came in on the loop, but on the wiring of the set as well. Another thing that was brought out was that with a set as sensitive as this several cases of interference could be detected at one time, putting you in the position of a mule between two hay stacks. When the set was moved, you probably listened in on some other trouble than the first one picked up—in other words, we had the cat chasing its tail, all fagged out and nothing accomplished.

At this point in the game it was decided that more brains and less traveling was necessary to get results. The decision arrived at then was the development of apparatus that would give compass action above anything else, also that the incoming disturbance should be suppressed so that only one case of trouble at a time could be handled. With the above in mind a return trip to Atlanta was made and a set and loop built up, attempting to incorporate these ideas.

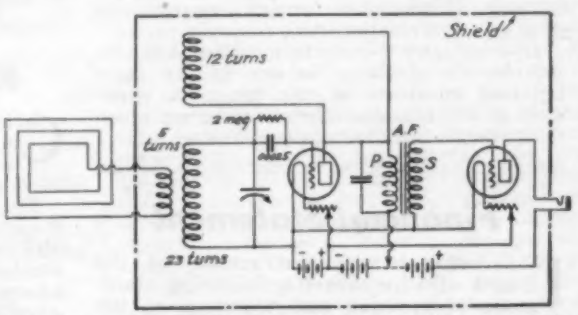
The final set was a short-wave 3-circuit tuner, the primary of which was untuned, the secondary controlled by a variable condenser, the primary and tickler coils being specially-wound low loss coils. The details of construction are given in the sketch shown. This receiver has a normal range from

*Supt. Transmission, Georgia Railway & Power Co., 4XY-4CP.

about 90 to 225 meters. A pine cabinet was next built, the entire inside being shielded with ordinary roofing tin, as was the panel of the receiver. This kind of shield was considered desirable due to the fact that iron made a very desirable electrostatic as well as electromagnetic shield. Attention was next given to the loop and a flat spiral was decided on and mounted on the top of the cabinet in such a manner that it could be rotated in a horizontal plane. The loop consisted of 10 turns of No. 26 D.C.C. wire spaced ⅝", the diaggonals being 24". Battery leads and phone cord were shielded with copper braid which, in turn, was soldered to the shielding of the cabinet. From the above it is apparent that the receiver itself was isolated in the metal shielding and that no signals cound enter except on the loop.

With the above equipment another trip was made in the early part of May to Augusta. The first step was a visit to several radio installations and a rough survey was made as to who was getting the worst interference. A station was then selected as a starting point, and the disturbance tuned in on a loud speaker, where it was audible in the street. The short-wave set, which was in a car in the street, was tuned in on the interference. The loop gave very definite compass action parallel to the street pointing east. The car was moved about a block, the loop still held its direction and the interference grew in intensity. The car was stopped at a street intersection, the loop pointing to an incandescent street lamp. A bamboo fishing pole was called into play and by hitting the lamp and wires with it, it was decided that the trouble was not at that point. Another move was made for a block; the loop still held direction down the street with an increase of signal strength. At the next street intersection the street lamp was again examined with the fishing pole. This time when the lamp was struck the interference was broken up. Business began to pick up. As a check one of the party was sent back to the original starting point and the hitting of the lamp had the same effect on the tuned in receiver as in the short wave set in the car. As another check the car was moved one block farther past the lamp; the intensity decreased and maximum signals could only be obtained by a reversal of the loop, which was pointing west now. A block still farther the loop still held its west direction and a decrease of signal strength. To further check the directional properties of the loop the car was moved south for two blocks and then west for two blocks. This then put us two blocks due south of the trouble-some lamp, and the loop indicated north and, as the lamp was approached with the short-wave set, the signal increased. In other words, an approach from three directions put us at the same point. It is well to mention here that in every case where a reading was taken the loop was rotated for minimum intensity, zero intensity and maximum intensity.

The next step was the calling out of a trouble crew from the local power company. The lamp was shorted out, no results; the circuit was jumped and lamp and leads disconnected, no results. An examination of the span poles disclosed nothing. The only thing noticeable was that as the lineman worked around on the pole the interference broke up. Finally all wires on the pole were shaken and when the span wire supporting the lamp was shaken the signal broke up, and when it was raised the interference stopped. A minute's examination disclosed the fact that the span wire was in contact wtih one of the 2300-volt primaries and was causing the trouble. The clearing up of the span wire relieved about three-fourths of the disturbance in that particular section. The loop had compassed to within twenty feet of the trouble, which was considered excellent and far superior to anything else tried. The other cases of trouble will be handled in a little different manner—that is, the various stations that are affected will report to one person who will plot on a map by means of colored pins having certain designations, such as red, bad; blue, medium; yellow, little; white, none. Condition of the weather, type of set used, etc., will also be noted. This procedure in a short time will indicate the center of the trouble. The short wave set and loop will then confine itself to the red section.



The Set used in Running Down Power Line Interference in Augusta.

Attention here is called to the Hartford case in March *QST*, where it is stated that an examination of the material removed from the school district did not show any defects. I am very much of the opinion that the trouble was not with the material,

but something else in contact with the circuit and, when the wires and fixtures were replaced, the troublesome contact was eliminated, also the interference.

A study is now being made of various kinds of receivers for this class of work; also various types of loops will be experimented with, for it is a known fact that the physical construction of a loop has a decided effect on its sensitiveness, zero point, direction, etc.

I would be more than pleased to hear from anyone who has any information bearing on the interference question, or give any information that I have.

In conclusion I wish to mention that this interference question is one of the most agitated questions of the time. A great deal of attention and study is being given to it by the national electric bodies.

Financial Statement

IN accordance with instructions of the Board of Directors the following statement of revenue and expenses of the A.R.R.L. for the three months ended June 30, 1924, is presented for the information of the membership.

K. B. WARNER, Secretary.

CONDENSED STATEMENT OF REVENUE AND EXPENSES

Quarter Ended June 30, 1924

REVENUE

Advertising sales	$17,134.22	
Newsdealer sales	7,686.96	
Newspaper syndicate sales	3,436.00	
Dues and subscriptions	5,742.97	
Back numbers, etc.	561.96	
Emblems	424.95	
Interest on bank deposits	153.37	
Bad debts recovered	96.33	
		$35,236.76

DEDUCTIONS

Returns and allowances	2,285.97	
Reserve for returns	664.99	
Exchange & collection charges	4.26	
Discount 2% for cash	323.40	
		$3,278.62
		$31,958.14

EXPENSES

Publication Expense	$11,262.89	
Salaries and commissions	13,035.31	
Newspaper syndicate expense	554.51	
Forwarding expense	491.53	
Telegraph, telephone and postage	1,418.06	
Office supplies and general expenses	1,791.50	
Rent, light and heat	725.34	
Traveling expense	702.54	
Depreciation of furniture and equipment	125.17	
Bad debts written off	1,046.59	
Traffic Department field expense	544.88	
Publicity Department field expense	34.57	
		$31,732.89
Net Gain from operations		$ 225.25

Ohio State Radio Convention

September 26th, 27th and 28th, 1924
Hotel Gibson, Cincinnati, Ohio

OHIO Hams, this is your convention—now let's go. There will be Trips, Talks, Exhibits, License Examinations, Oodles of Stunts, a Banquet and the R.O.W.H. initiation. Write for further information to Elmer H. Schubert, Executive Chairman Convention Committee, Union Central Radio Association, Union Central Building, Cincinnati, Ohio.

Kansas State Convention

CHOOSING July 4th as the most convenient day, a group of Central Kansas hams staged a "baby convention" at Wichita, Kansas.

The morning was spent in inspecting Wichita stations. The main curiosity was 9BEZ's 20-watter which has been heard a number of times in New Zealand. It was whispered that he puts iodine in his rectifier when he craves DX. There followed a ball game in which the "RAC" team defeated the "DC" team by a wide margin. Kansans and Oklahomans then held an informal meeting on amateur maters in general, but particularly on the one of planning a big convention for the whole state next year.

ABU of 9BIO.

Dakota Division Convention

THE Dakota Division of the A.R.R.L. will hold its second annual convention the week-end following Thanksgiving, November 27th to 29th, inclusive. Plans are laid to hold an initiation into the order of the Wouff-Hong. The convention will be held at the new $2,000,000 Eelectrical and Radio Engineering Building of the University of Minnesota, Minneapolis. Details may be had from Harold DeRoe Jones, 9GT; L. C. Smedy, 9AUL, or G. W. Volkenant, 9IG-9VL.

Short Wave Daylight Transcons

Attention, Gang! Get set for some Sunday daylight Transcons on short waves. The dates probably will be November 9th and 16th. You have plenty of time to get ready by then, but get lined up for your best daylight DX and be ready on the 75 to 80 meter band.

—F.H.S.

Hot Wire vs Thermocouple Ammeters

*By H. B. Richmond**

THERE has been so much misunderstanding among radio operators on the subject of the proper kind of ammeter to use for measuring radio frequency currents that a brief comparison of the respective advantages and disadvantages of the thermocouple and hot wire types does not seem out of place at this time. There are very ardent advocates for both types and undoubtedly both groups are right, but before making any comments let us study the following tables:

ADVANTAGES

Thermo Couple	*Hot Wire*
Greater accuracy	Lower cost
Quicker action	More rugged
No zero adjustment	Good for any frequency
May be made in lower ranges	Stands larger overload
	Varies less with time
	Indicates burn out or heavy overload
	More uniform scale
	Ease of repair

DISADVANTAGES

Thermo Couple	*Hot Wire*
High cost	Sluggish
Fragile	Inaccurate
Small overload capacity	Requires temperature adjustment
Cannot be checked on D.C.	
Large error when D. C. component exists.	

On small sized meters (such as the radio amateur usually uses) the accuracy of the thermocouple instrument is within about ½% and that of the hot wire meter 2%. For most work, such as the measuring of antenna currents, any meter within 5% is satisfactory. The thermocouple meter responds to changes more quickly than the hot wire meter. If very rapid changes are to be followed this is a decided advantage, but where the current is fluctuating as it often does in radiating systems the inertia of the hot wire meter is a decided advantage. The hot wire meter requires a zero adjustment before using. Under usual conditions no adjustment is required on the thermocouple type.

To be compared with these advantages of the thermocouple meter the hot wire meter is lower in cost—usually ½ to ⅔ less—a very decided advantage to most amateurs. It is more rugged, which feature is of great importance. For this reason many experimental laboratories use hot wire meters very extensively in preference to thermocouple meters and it is also the common European practice to do so. The hot wire meter also stands greater overloads and when burned out is easily repaired. If burned out it indicates at once that the meter is defective while the thermocouple meter must be tried out to locate a defect.

A point of great importance in favor of the hot wire meter is the ability to use it on direct currents as well as radio frequency currents. It may be checked at any time by comparing it with a direct current meter. The thermocouple meter may not be used on direct currents or on low frequency alternating currents. When used in oscillating circuits where there is a direct current component present the thermo couple meter will not measure the true current flowing in the circuit, while this true value is given by the hot wire type.

When used with wall types or even portable galvonometers, the thermocouple combination may be used for much smaller currents than are measurable with the hot wire types.

Summed up, the thermocouple type of meter is best adapted to conditions where it will not receive hard usage, where there is little chance of overloading, where rapidly fluctuating readings must be made, and where a relatively high accuracy is necessary. The hot wire meter is best adapted to general all-around service; it will stand hard usage and reasonable overloading, it is equally accurate on direct current or alternating current of any frequency; it is a practical meter that fits most amateur's pocket books.

General Radio
Hot Wire Ammeter

Weston
Thermocouple Ammeter

And, finally, "thermocouple amperes" and "hot wire amperes" are all one and the same. They all depend on the same I^2R law.

*Secretary, General Radio Co.

Inductance Design

*By Paul C. Watson, 4XX**

WITH the trend of amateur construction toward better apparatus and toward properly proportioned inductance and capacity values, it is well worth while to consider a few simple calculations applied to inductances. In the August, 1922, *QST* the writer presented a paper treating on condenser design, bringing out the main points to be considered in selecting the proper type and capacity for a circuit. This paper is intended to follow along the same lines, applying to inductance rather than to capacity.

The considerations made by most amateurs in winding an inductance cover the size wire at hand, and whatever is available for a winding form. Sets so designed seldom give the best results, whereas careful design of the parts would make an efficient assembly. With a few simple calculations, coils of the desired inductance can be made, or the values of coils already made can be determined. If good material has been used, paying particuler attention to insulation, results of surprising accuracy will be obtained. In treating the subject from this angle it is best to start with an elementary discussion in order properly to follow the reasoning of the mathematics that follow.

What Inductance Is

If a current "i" is flowing through a circuit at any instant there is associated with the circuit magnetic energy which is proportional to half the square of the current and to a constant "L" which is called the "Inductance" of the circuit. From this the energy is measured by $\frac{1}{2}Li^2$. If the current changes then the *rate* at which this energy varies with the current is called the "Electrokinetic Momentum". It is therefore measured by "Li". The self-induced EMF in the circuit is equal to the rate at which the Kinetic Momentum varies with the time. It is therefore expressed by

$$L\frac{di}{dt}$$

From this, we can measure the inductance if we know the value of this self-induced EMF and the time rate of change of the current. From this follows the definition of the unit of inductance, the "henry". If a current is varying in a circuit of one turn at the rate of one ampere per second and if the self-induced EMF is then one volt, the circuit is said to have an inductance of one henry. Small inductances are measured in *millihenries* or *microhenries*, also in the C.G.S. unit of a *centimeter*. One henry is equal to 10^9 cm.

To get a practical working basis, figures that may seem remote from the above are used.

Design Formulas

The inductance of a single-layer coil may be written as follows:

$$(1)\quad L_s = .002\pi^2\left(\frac{2a}{b}\right)n^2\,aK \text{ microhenries}$$

Where:

a = mean radius of coil in cm.
b = length of coil in cm.
n = number of turns.
K is a factor depending on the ratio

$$\frac{2a}{b}$$

alone. A table for the value of K was prepared by Nagaoka and can be found in Scientific Paper No. 455 of the Bureau of Standards.

The inductance of a coil of rectangular cross section with the same "a" and "b" dimensions as that of a single-layer coil, with the same number of turns, and with the thickness "c" (mean radius the same) will be less than that of the single-layer coil. Considering the effect of the rectangular cross section we have:

$$(2)\quad L_m = .002\pi^2\left(\frac{2a}{b}\right)n^2a\,(K-k),$$

$$L_m = .002\pi^2\left(\frac{2a}{b}\right)n^2aK' \text{ microhenries}$$

in which L_m is the inductance, supposing the current to be uniformly distributed over the rectangular cross section. K' is a function of

$$\frac{2a}{b}$$

and the dimensions of the cross section. The quantity k shows how much less the factor K' is than K, for the single layer coil with the same ratio

$$\frac{2a}{b}$$

This is a result of the current spreading

*Radio Supervisor, U.S. Shipping Board, Savannah.

over the rectanguler cross section. Values for K′ and k are given on page 478 of Scientific Paper No. 455 (Bureau of Stds.) This pamphlet can be obtained from the Supt. of Public Documents, Washington, D. C., for 10¢ in cash or postal money order.

Another method of calculation is based on the formula—

(3) $L_n = .001\ n^2aP$ microhenries

Where:

c = width of disk in cm.
a = mean radius.

In the case where the "b" dimension is negligible, the value obtained by the third formula is that of a current sheet. "P" is a function of

$$\frac{c}{2a}.$$

A table for the correct values of P is also found in Pamphlet No. 455.

Using this formula as a working base, we can calculate the inductance of a coil of rectangular cross section from the following:

(4) $L_n = .001\ n^2aPf = .001\ n^2aP'$ microhenries

"f" is a factor which reduces the value of inductance due to the distribution of current over the cross section, the values for "f" and "P'" being given in Paper No. 455.

The fourth formula is particularly suited for short thick coils such as disk or pancake types, while Formula 2 is more suited to long windings. On the average problem, however, either will give fair accuracy, and an easy check on the problem can be made by solving both ways.

The above calculations do not take into consideration the effect of the insulation. To obtain more exact values the following corrections must be applied to the foregoing formulas:

(5) $L = .004\pi an\left\{Lg_e\frac{D}{d} + .1381 + E\right\}$ microhenries

Where:

d = diameter of bare wire
D = distance between wire centers in same layer or consecutive layers.

"E" is a quantity depending on the number of turns and their arrangement. In many cases it is approximately .017. The value obtained in Formula 5 is to be *added* to the results obtained in either Formula 2 or 4. When the wires are widely separated the correction will be greater, but even then will be exceedingly small.

Effect of Distributed Capacity

The effect of the capacity of the coil itself when used in a resonant circuit and receiving its current from another circuit inductively coupled to it, is that of a capacity connected in parallel to the coil winding. The resonant capacity of such a coil is expressed:

$$\frac{I}{X^2} = L_o(C + C_o)$$

Where:

X = 2π times frequency
L_o = Inductance of coil
C = Capacity in series with coil
C_o = Capacity of coil

It can be understood from this that the coil functions as if the effective inductance were

$$L = L_o\left(I + \frac{C_o}{C}\right)$$

greater than the low-frequency inductance. For frequencies near the value X given by

$$\frac{I}{X^2} = L_oC_o$$

the reactance opposed by the coil to an EMF impressed from the outside is very great. The coil and its capacity are in parallel resonance with the rest of the circuit and function as a "filter" or a "trap". This frequency is said to be the natural or fundamental frequency of the coil.

The effect of dielectric absorbtion is very difficult to estimate—in cases where it is large the resistance of the coil will be increased while the effect on the inductance will be small.

The preceeding calculations can be applied to bank wound, single layer, spaced layer and pancake coils. The results in calculating "honeycomb" coils are questionable; however, the writter has had fair success on these as well as the above.

It is recommended that the tables found in the Bureau of Standards publications be used for these calculations in preference to ordinary texts, many of which are subject to some errors.

Additional references are: Pages 242-299, Circular No. 74, "Radio Instruments and Measurements, Bureau of Standards. Sold by Supt. of Documents, Gov't Printing Office, Washington, D. C., for 60¢ cash or money order. Pages 384-389 of "P.U. R.C.", radio communication pamphlet No. 40, Signal Corps, U. S. Army. Sold as above but price $1.00.

Additional references too numerous to list may be found listed in Bureau of Standards Circular No. 24 "Publications of the Bureau of Standards", to be obtained from the Bureau.

Designs for iron-core chokes are given in *QST* for July and August, 1923; refer especially to pages 22-25, August, 1923.

The Tuner at 9MC

Another Low-Loss Amateur Tuner

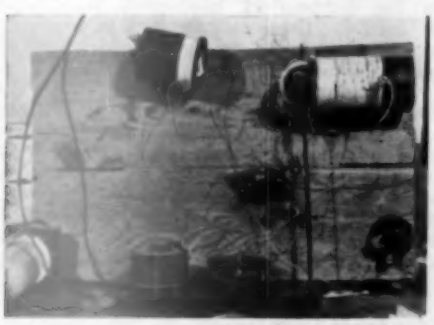
AT 9MC, 9ZT and several other stations a somewhat unusual tuner has been giving good results, partly because it obtains great selectivity by means of extremely loose coupling and partly because its builders have not made the mistake of attempting to build it compactly enough to get it into a cabinet.

The Circuit

Right at the start let us say that this tuner does *not* depend on the use of a freak circuit; it uses our old and tried friend the inductively-coupled tuner with regeneration. The secondary circuit is tapped but again the builder had the good sense not to hang a lot of switch-point-losses on to the circuit but uses an ordinary clip on a flexible wire instead. Beyond that there is nothing startling about the set excepting that on C.W. it will work very beautifully with coupling all the way from four inches to eighteen inches. This means two things, first, that the set will be selective and, second, that we will hear no signals unless the secondary circuit is a really good one.

Building the Set

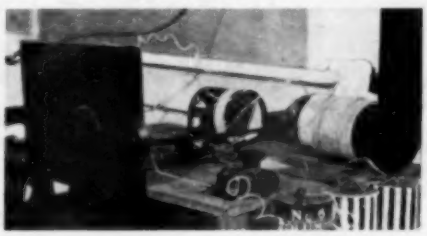
The set is built "breadboard fashion". This does not make it look well but it does make it produce good results. This board should be dry and since it may not stay that way in all kinds of weather it will be a good idea to give it a coat of paraffin. This should be put on with a brush while smoking hot so that it will soak in and not leave a sticky surface to gather dust. When it comes to connecting the set up, do not do too nice a job of wiring but run the wire in straight lines, curves, or any other way that will keep them up in the air and clear



of the baseboard. Do not use a box over the set and do not try to use a big panel. It is a good idea, though, to keep a cloth over the set when not using it. Dust in a variable condenser runs the losses up rapidly. Only a small panel is necessary to carry the secondary condenser, the rheostat and the tickler shaft and dial. The secondary variable condenser should be so built that no metal parts excepting those connected to the rotary plates touch the panel; then there can be no loss in the way of leakage through the panel, regardless of the material used.

The Primary

The primary circuit is tuned by means of a series condenser. Like all tuned pri-



maries the setting can often be left alone over a considerable wavelength range although the signals are always a little better if the primary is exactly in tune. The primary condenser need not be a very good one; almost anything with a capacity of .0005 will do. There is so much resistance in the primary circuit that the little extra introduced by anything but a very awful condenser does not make any change.

The primary winding consists of 16 turns of No. 18 double cotton-covered wire on a three inch tube. This tube is made movable or fixed as desired. At 9MC it is frequently used *as far as 18 inches* from the secondary when receiving CW. It is *seldom or never brought closer than 6 inches* to the secondary.

The Secondary

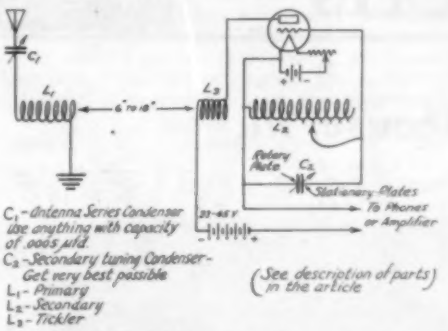
The secondary winding consists of 70 turns of No. 18 double cotton-covered wire on a three inch tube. The winding is tapped at 20, 30, 40, 50 and 60 turns. Do not spoil a good secondary by running the taps to a switch but use a clip on the grid wire and move it along the winding as desired.

With a three-plate variable condenser this set tunes from 50 meters to 230 meters with the tuning well spread out over the condenser scale. With the clip on the seventieth turn, the set tunes from about 145 to about 230 meters, covering the amateur range nicely.

The Tickler

The tickler is wound on an ordinary secondary ball three inches across. The

tickler does not go inside of the secondary but right at the end of it. It therefore has very little tuning effect and the receiver may be calibrated. The tickler winding consists of 20 turns at 9MC but it is best to try your particular one, reducing turns until the set just oscillates nicely at the upper end of the tuning range. When



properly adjusted the set will oscillate over the whole range of the condenser on any of the secondary taps.

General Construction

The secondary condenser should be the best one that you can possibly get hold of. If you cannot get a vernier condenser that you are sure is very good (and most of them are not) better get hold of a good five- or eleven-plate condenser and cut it down. A five-plate condenser may be used to cover the same wavelength range by reducing the secondary to 55 turns and omitting some of the taps. However, this does not give so open a tuning scale.

The object of mounting the secondary so far back on the board is to prevent hand-capacity effect. A slight improvement is to mount the secondary condenser in the same fashion with an insulating (wood or bakelite) extension shaft. When using a tapped coil it is always an open question whether the unused part of the coil should be left hanging free or should be short-circuited. In any one particular tuner the best way to find out is to try it and see. Occasionally short-circuiting the unused part of the coil will improve the signal strength.

Tubes

For C.W. work do not use a big tube. Better results are gotten with a C-299 or a UV-199. Do *not* use an adapter but get a socket to fit the tube and make sure the socket is of good material.

Radiation

The interference from this tuner is very small if it is used as it should be used—with antenna coupling *always* over 4", with a small detector tube, and with a plate voltage of 45 or less.

—*"Hen."* + *S.K.*

Notice to Our Newsstand Readers

As announced in recent issues, The Traffic Department Report and the "Calls Heard" Department have been eliminated from the newsstand edition of *QST* because our non-member readers in general are not particularly interested in them. This results in a saving in expense which makes possible the publication of a larger and better *QST*.

These two departments are included in the edition supplied to members of the A.R.R.L. If you are interested in them, it is proof positive that you ought to be a member of the League. May we not direct you to the handy application blank appearing *on* page 81 of this issue?

The Tech. Ed.'s Paragraph

THERE is one thing about *QST* articles that would be funny if it were not so aggravating. Every time a demand for a particular variety of articles develops we go out and do our best to get the article. Nine times out of ten we do not get it. What we do get is a lot of raw material from which the final article can be written. Very well, we write the article and print it. The day that the magazine gets on the newsstand we start to get articles on that subject, sometimes we get ten or twelve of them and the deuce of it is that often some of these articles are better than the original one. You can imagine how difficult it is to explain to the authors why we do not use them, the explanation that an article on this subject was just printed and another one is out of order does not seem to please them at all.

Don't be so bashful about it, send in your articles *before* you see something like them in *QST*.

Amateur Radio Stations

9MC, Roodhouse, Ill.

9MC needs no introduction. The DX work represented by the collection of cards in the above photograph speaks for itself. In a recent *QST* F. D. Bell, New Zealand 4AA said, "9MC is easily the leader," when speaking of his record reception of over 500 North American amateur stations. This, too, is a record for 9MC's operators to be proud of.

This station is located at Roodhouse, Illinois and is owned and operated by Mr. A. H. Cain, whose personal sign is "hen" and his son, Bud, whose personal sign we do not know. The "shack" is located in the center of a large tract of level land between two 80 foot pipe masts. The antenna is a five wire flat top T 53 feet long, with a fan down-lead. An eighteen wire fan counterpoise is used, eight or nine feet high.

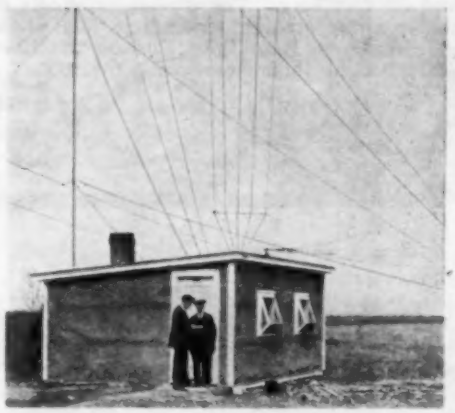
"We have just one sending set and it is arranged so we can use several kinds of power on the plate," says Mr. Cain. We have the choice of full and half wave self-rectified 60 cycle current, chemically rectified, chemically rectified and filtered, or 500 cycle A.C. in any of the above forms. Direct current from 500 to 2500 volts is obtained from a big motor generator. We use two 250-watt tubes and we have a 50-watt tube around for use as a speech amplifier if we care to use fone."

Various transmitting circuits are used. The normal sending wave is 183 meters. With 2000 volts D.C. on the plates and a current of 210 milliamperes, the antenna

current varies between 5 and 8. With 7,000 volts A.C. on the plate the current is 230 milliamperes and the antenna current eight to ten amperes.

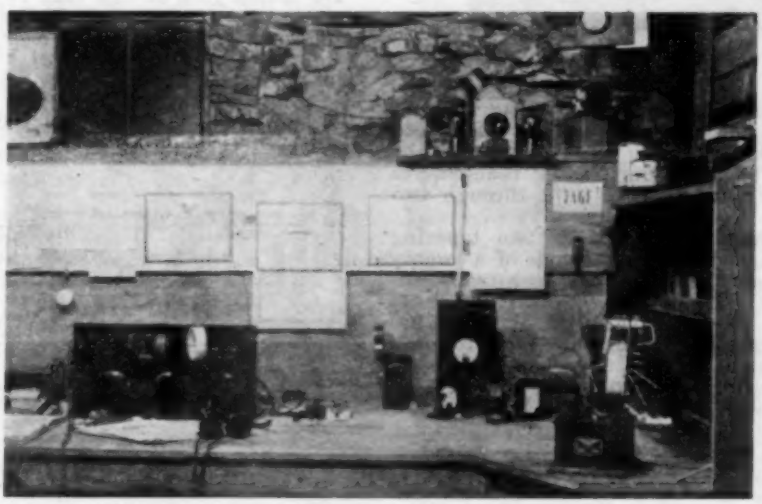
The photograph doesn't show the apparatus very well; but the transmitting set is at the far end of the room and the receiving equipment is on the table in the foreground. At the left end of the receiving table is a 9ZT low loss tuner which is used mostly nowadays. The antenna send-receive switch is mounted on a sub-panel suspended from the ceiling at the entering insulator. It is worked from the operator's table by a lever system. The large masses hanging from this switch are the transmitting series condensers; two of them in series, each made of 10 by 12 glass plates and copper foil. The high voltage generator is seen on the floor. It is belted to a motor which is out of sight on the right, behind the table.

9MC is very modest about the work of his station. "I can think of nothing more



to say, unless it be mention of our having worked stations in all U.S. and Canadian districts on several different occasions in less than four hours!" he says! "The four walls and half of the ceiling are papered with cards from fellows who have heard us."

7AGF, Troy, Mont.



7AGF is located at Troy, Montana, away up in the northwestern tip of Montana. The nearest active radio stations are in Spokane, Washington, 100 miles away. Mr. Frank Prince, the owner, builder, and operator of 7AGF has never seen a good C.W. outfit, he says, and has met only one C.W. operator since leaving the old spark gang at Bozeman, Montana in 1922, so desires to inform *QST* readers that his station is not all it might be.

Nevertheless, we all envy Frank that

93-foot stick and nearly vertical antenna. He had an exciting time getting it, too. "The mast is made of two cedar poles, 50 and 59 feet long. There were no roads in this country straight enough to haul these poles over, so I cut them close to the river and brought them home with the aid of a

rowboat and an Evinrude." he relates. "This five mile trip proved quite exciting as the motor had to be run at full speed to keep the boat from being rammed by the poles. The river runs better than twelve miles per hour and we went through two rapids!"

The antenna is made of two tapering cages suspended from the ends of a twenty foot spreader, and an eight inch cage leading from the juncture of the two cages down to the entering insulator. The apparatus is in a basement room and the lead is brought in through the window. A wire with several insulators in it can be seen with its ends fastened to the center of the main spreader and the juncture of the three cages. This effectually takes the weight of the heavy down-lead from the ends of the big spreader. A multi-wire fan counterpoise is installed about eight feet high, underneath the antenna. The receiving antenna is a single copper-clad wire, 340 feet long, running WNW from the station up the mountain side.

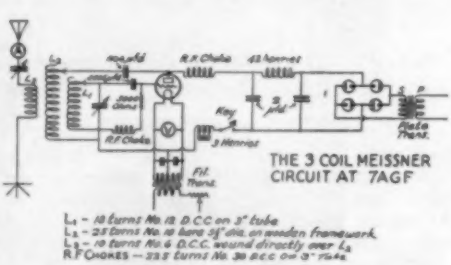
Two UV-202 "5-watters" are used in the transmitter, with the filaments never operated above 7.5 volts. The average life of a tube is from 6 to 10 months at this station. The transmitter is located on a shelf in the upper part of the picture to accommodate the counterpoise and antenna leads, as the set is located in a basement room anyway. The meters and plate supply transformer and filter is on the table. Plate supply is obtained through a 500 watt, 1500 volt transformer, the secondary voltage being variable in 150 volt steps. There is a forty jar electrolytic rectifier on the shelves in the right of the picture. The electrodes have a submerged portion of 1 by 1/2 inches, and are separated one inch. The electrolyte is a borax solution with a little ammonia added and a little transformer oil on top to prevent creepage. The no-load loss at 1500 volts is around 20 watts.

The three coil Meissner circuit with tuned grid coil and parallel plate supply is used, as evident from the wiring diagram. The wave is easily varied as the antenna series condenser and grid tuning condenser are the only things to change. The normal plate input at 950 volts or thereabouts is 190 milliamperes to the two tubes. The antenna current with this input is .7 amperes at 145 meters and 1.5 amperes at 200 meters.

7AGF has been in operation for two years. The station has always been an important link in handling relay messages to and from the Pacific Northwest for stations are few and far between in that country compared to what they are elsewhere. The usual operating hours are from 11:00 p.m. until midnight, M.S.T.

On March 15th of this year 187 different stations had been in communication with 7AGF, and 49 of these were over 800 miles distant.

The receiver is a honeycomb coil set, hooked up in standard style. Coil for covering the wave band from 60 to 20,000 meters


R.F. Choke
42 henries
Key
2 mfd
3 Henries
R.F. Choke
Fil. Trans.
Plate Trans.
THE 3 COIL MEISSNER CIRCUIT AT 7AGF
L1 - 10 turns No. 18 D.C.C. on 3" tube.
L2 - 25 turns No. 18 bare 3" dia. on wooden framework.
L3 - 10 turns No. 6 D.C.C. wound directly over L1
R.F. CHOKES - 225 turns No. 30 D.C.C. on 3" rods.

are available. KDKA's 100 meter wave is QSA here. Several European arcs have been copied in daylight on detector only. Reason;—the detector tube is an Audiotron, the last of five purchased in January, 1921. A complete log of all transmissions is kept with time, wavelength, and so forth. The station wavemeter has been calibrated, with the aid of WWV, BC stations, harmonics, etc., from 70 to 600 meters.

English Amateurs Experiment with Train Radio

English amateurs have just concluded some successful tests with radio on moving trains, according to an interesting letter from Mr. Philip Coursey, Secretary of the Radio Society of Great Britain.

"A car attached to the "Scotch Express" which left London at 7:38 P.M. last night had fitted up in it an amateur transmitter (just a rough lash-up affair) and short wave receiver, with a small two wire aerial *inside* the car. We were able to pick up messages from 6XX (London) throughout the whole of the 276 mile run to Newcastle, and to carry on two way communication on 185 meters with amateur stations along the route (all using only a few watts of power) in some cases up to about 100 miles. All the logs of the test are not yet at hand, but some very interesting data was observed. This I think is the first time that a radio transmitter had been used on a train in this country, and it certainly time that anything like this has been attempted in this country using amateur apparatus. The test was made by a number of us attached to the Radio Society of Gt. Britain, and the car, etc. was supplied by the London and N. Eastern Ry. Co."

Amateur Transmission Beginning in India

Radio conditions in India are gradually shaping themselves so that we may expect several amateur transmitting stations to be on the air before long. Radio clubs are getting along well in face of the fact that radio is a thing so new to the people of India. Broadcasting stations are being built and several are in active operation. Regarding the status of the transmitting amateur, Mr. B. C. Sinha, 147, Baranasi Ghose's St., Calcutta, says in a recent letter, "Government is very slow in allowing the transmitting license to the public. Though I have been fortunate enough in getting the License, I have not yet been able to work it for difficulty in getting suitable apparatus for experimental purposes. I am after it and am trying to construct a transmitter at home as soon as I get all of the components. The government does not allow us to purchase wireless things from foreign countries without special sanction. I have recently written for this permission."

Interest among amateur radio men is directed especially toward India at this time because a good relay station there would remove the worst barrier to a relay around the world; bridging the gap between South Africa and Western Australia.

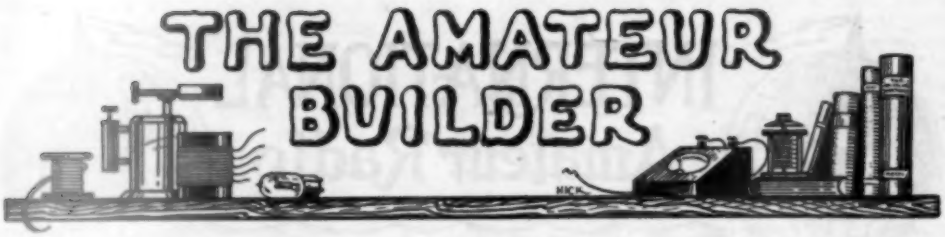
English Station Transmits Standard Waves

A schedule of standard waves is being transmitted by station 5HW of the National Physical Laboratory at Teddington, near London, England, thus giving British experimenters a service comparable to that of WWV in this country. These transmissions from 5HW take place on alternative Tuesday afternoons, beginning at 3:00 P.M G.M.T. The wavelength range covered is from 833 to 5,000 meters, sending the shortest wave first, and the transmitting is done on a schedule somewhat similar to that of WWV. The transmitting system at 5HW employs a master-oscillator and a power-amplifier, the later operating with a plate potential of 2,500 volts. The antenna current varies from five amperes at 833 meters to two amperes at 5,000 meters.

Australians Hold Convention

The Victorian Section of the Wireless Institute of Australia held its first exhibition on May 14th in the Melbourne Town Hall. The attendance was 9594 for the four days, resulting in a bit of "cash in hand" for us to do things with. We held the first Victorian Convention (3rd District) on Thursday the 15th and the First Federal Convention on Friday and Saturday. Result, federation of all radio clubs in Australia at last. Many suggestions were put forward for bettering the existing conditions and regulations from an amateur point of view. On Saturday night we had our first Convention Dinner, at which the Controller of Wireless congratulated us on our own suggestions and agreed to use his influence in including them in the new regulation.

—*Maxwell Howden*, Aust. *3BQ*.

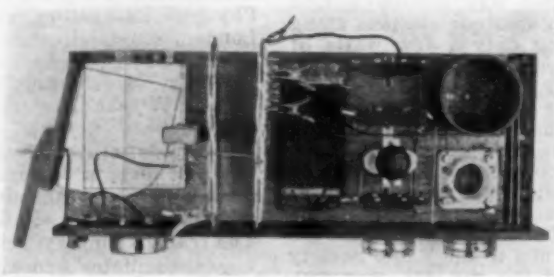


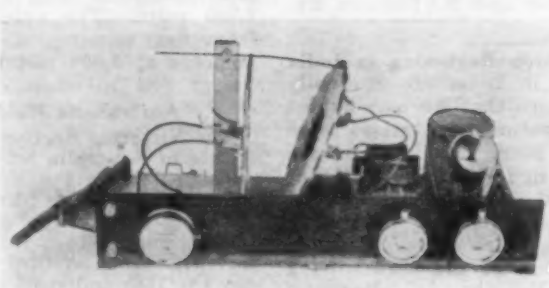
A FIVE WATT SENDING SET FOR $25

By H. F. Mason, Dept. Editor

Even in these days of 250-watt tubes and big motor generator sets there are a large number of amateurs whose limit, financially speaking, is a lone "5-watter." Here is a set using one 5-watt tube that is not expensive to build, yet it includes the latest kinks in amateur C.W. practice. This set will make a fine companion to your "low-loss" tuner.

THE first question about a transmitting set that a fellow wants answered, —or maybe it is his dad who wants answered—is, "How much is this thing going to cost?" Well, that all depends. You can buy all of the fixin's and do-gadjits and make a set that cost a couple of hundred dollars and still have only a 5-watt set, or you can buy only a few things, make the rest of the parts yourself, hook 'em up in a good old circuit, and talk to amateurs several hundred miles away for $25. The latter sounds the best.





But wait a minute; the title to this story is wrong. This set we are going to build will have about 30 or 35 watts or in its plate circuit and will put 10 or 20 of them into the radiating system. So even though it does use only a "5-watter" we wouldn't want to come right out in the open like that and call it a 5-watt set. Let's call it a set using one "5-watt" tube, that's better.

"How far will it send?" No one knows, and no one can tell you. Unless you are located in a very bad "hole" stations from 25 to 50 miles away will be able to hear you in the daytime regularly. At night the range will be many times greater. On a clear, cool, winter night there is a possibility of your signals being picked up by a station several thousand miles away.

"What kind of plate supply shall I use?" Some amateurs like to hear the whirr of a motor generator, while others prefer to mess with electrolytic rectifiers. Some like to have a filter (and go hunting among live filter condensers for dead ones). To others "raw A. C." on the plates causes a racket sweeter than all music. So just for the sake of not getting into an argument at the beginning, let's get the set built first and talk about the advantages and disadvantages of various kinds of plate supply next month. We'll build the set so you can connect it to any kind of supply you wish.

Every Receiver a Transmitter

A sending set is not so vastly different from a receiving set as you might suppose. You know, for instance, that when you let your receiving set oscillate, and your neighbor does the same, and the two are oscillating on nearly the same wavelength, both of you hear a "squeal." You say, "that's

Jones' receiver that is making the noise," and Jones says "that's Smith over there whose receiver is causing the noise." As a matter of fact each of your oscillating receiving sets is acting as a miniature sending set and is sending to the other station. If one of you were to connect a telegraph key into the circuit in series with the B battery so you could switch the battery on and off rapidly you could send code signals

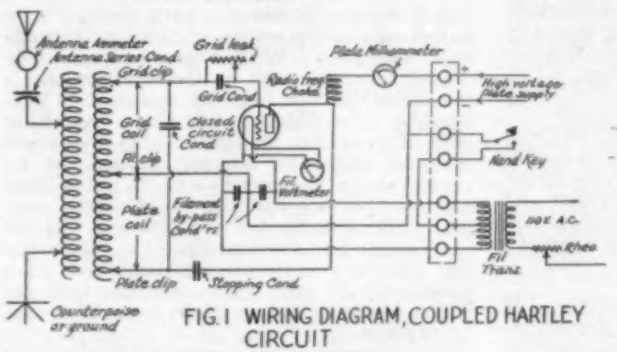


FIG. 1 WIRING DIAGRAM, COUPLED HARTLEY CIRCUIT

to your neighbor. A transmitting license would be necessary, as explained later.

A receiving set will not send far; its range is not much over a few miles. It can be made to send farther by substituting for the regular B battery, a source of high voltage supply of from 50 to 1500 or 2000 volts. The size of everything in the set must be increased greatly when this is done, however, so as to take care of the greater amount of energy involved. A vacuum tube having a larger plate, grid, and filament must be used, condensers must be built to stand higher voltages, coils must be wound with heavier wire, and care must be taken to well insulate the live parts of the set from one another.

The hookup used in most sending sets is, in principle, the same as that of a one tube regenerative receiving set, though the details vary greatly. The *Coupled Hartley* circuit is used in the set we are about to build.

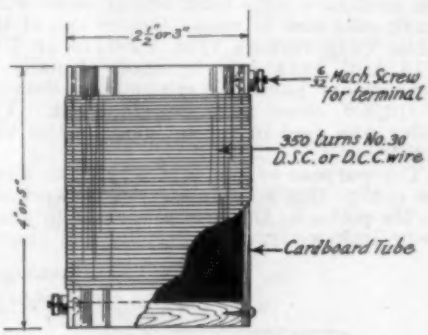
Sending sets act just like receiving sets when it comes to making them work. In the same manner that a certain adjustment of inductance and capacity values in the circuit gives you louder received signals, so will a certain adjustment of the sending set increase your sending range.

Government License Necessary

You will need two government licenses before doing any transmitting. One is an *amateurs operator's license*, certifying that you have been examined and qualify as an operator; and the other is an *amateur station license*, certifying that your station is adjusted in accordance with the law with regard to wavelength, power, and so forth. All forms of "outlaw" transmission as by connecting a telegraph key to your receiving set and sending code signals "just for the fun of it" are strictly prohibited. Make application to the Supervisor of Radio in your district for the necessary license forms sufficiently in advance so you will have the license by the time your sending set is ready to go on the air. More information regarding licenses and examinations, together with the addresses of the nine Supervisors of Radio are given in the article "Getting On The Air" on page 55 of the January, 1924, *QST*, to which Amateur Builder is referred.

General Arrangement

The general arrangement of the parts of the transmitter is clearly shown in the photographs. All of the parts except the filament transformer, apparatus for furnishing plate supply, and the hand key, are mounted on the baseboadr. Their relative position is made as much like the diagram as possible so the wiring will be simple. Another board is fastened to the front edge of the baseboard to provide a place for mounting the meters. A strip of hard rubber or bakelite, seen on the extreme right in the top view, carries seven binding posts for external connections. Binding



RADIO FREQUENCY CHOKE COIL
FIG. 2

posts for antenna and counterpoise (or ground) are mounted on the left-hand end of the front panel, and should be separated at least two inches.

A description of the individual parts used in building set follows. In many places a piece of apparatus is described in several ways, to fit available material and the pocketbook of the builder.

Radio Frequency Choke Coil

This coil, see Fig. 4, consists of about 350 turns of No. 30 D.S.C. wire wound in

a single layer on a cardboard tube. A honeycomb coil will not do. An old dry cell case or a Dutch Cleanser can is fine for winding this coil on. A circular disc of wood is fitted inside the lower end of the coil, glued in place, then fastened to the baseboard with two screws. The position of this choke in the circuit is evident from the diagram. Its purpose is to prevent radio frequency energy from "backing up" into the power supply. It is important that this choke coil be effective, for any energy that gets by it is that much more subtracted from the antenna circuit.

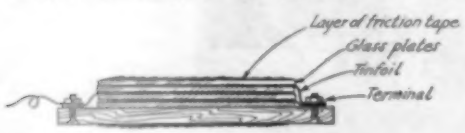
Vacuum Tube Socket

The socket should be one that will not soften when heated. It should be of standard size for the base on a 5-watt tube is the same as that on tubes of the UV-200 and UV-201A type. A Hart & Hegeman porcelain socket was used on the present set.

Grid Leak

The grid leak should have a resistance of from approximately 5,000 to 15,000 ohms, preferably variable either continuously or in steps, and capable of carrying 10 milliamperes or thereabouts. The best value of resistance to use can only be found by trial. A receiving grid leak will not do, but there are several things that will serve. Several Lavite resistances may be connected in parallel to give the required resistance. Or, the secondary coils from one or more Ford spark coils may be used. One or two of the Radio Corporation's type UP-1719 or UP-1718 grid leaks may be used. Finally, a Bradleyohm having a minimum resistance of 10,000 ohms may be employed. The latter was used in the set described in this article.

The purpose of the grid leak is to allow the charge that accumulates on the grid and on the plates of the grid condenser to gradually leak away, thus keeping the charge



How the glass plate fixed condensers are put together (The right number of plates is not shown)

FIG. 3

from ever becoming great enough to block the tube. The value of grid leak resistance also influences the plate current; the plate current will become greater as the grid leak resistance is reduced, and less as the resistance is increased.

Vacuum Tube

The vacuum tube used in the set is a Rolls Royce type 202 tube. A Cunningham C-302 or General Electric type UV-202 may also be used. Some may want to use a VT-2 Western Electric tube. If this is done the pin on the side of the base of the tube should be cut off, as it is in a different position and will not let the tube fit the socket if left on. If a General Radio socket is used the socket shell can be moved to accommodate the pin as it is placed on the VT-2 tube.

Meters

A filament voltmeter is very necessary on any transmitting set using tubes with tungsten filaments. With tubes having oxide coated filament, such as the Western Electric type VT-2, a filament ammeter is preferable. The filament voltmeter (speaking now of tungsten filament tubes) helps the operator keep the filament voltage at its rated value. He may be able to get a little more output by running the filament over its rated capacity, but the filament will not last long. The average life of a transmitting tube is very much less than that of a receiving tube anyway, so anything that can be done to lengthen its life is looked forward to eagerly.

The filament voltmeter should have a scale reading preferably 0-10 volts, though 0-15 will do and is better if you are figuring on putting in a fifty-watt tube later. Be sure when ordering the voltmeter, to specify whether the meter is to be used on A.C. or D.C., and if the former, state also the frequency. The simplest and least expensive way of going about getting a filament voltmeter is to buy a 98¢ pocket battery testing voltmeter and re-calibrate it as explained in the "Strays" section of this issue. It should have a scale reading 0-10 volts or thereabouts to begin with. After re-calibration there should be a red line drawn across the scale at the 7.5 volt reading, indicating the danger point above which the filament is overloaded. A S.P.S.T. switch should be provided for cutting the voltmeter out of circuit when readings are not being taken, because these little pocket meters will not stand being left in circuit continuously. A better grade of voltmeter can be left in circuit all of the time the sending set is being operated without harm.

Next to a filament voltmeter, an antenna ammeter is a good investment. It shows how much current is flowing in the antenna circuit and gives an indication of how the set is working from day to day. The number of miles you can transmit cannot be measured in terms of amperes flowing in the antenna circuit. A small current flowing in a high or nearly vertical antenna will give just as good results as a large current in a low antenna, as a general rule.

We will need an antenna ammeter of either the hot wire type or of the thermocouple type. An ordinary direct current ammeter, such as is used for measuring the current in a circuit connected to batteries will not do. The ammeter used on the set

in the photograph is a G.E. type UM-530 hot wire ammeter. The antenna ammeter should have a scale reading 0-2.5 amperes preferably, but if your antenna is very large and high current may never be more than one ampere, in which case a meter reading 0-1.0 amperes will be all right. This meter is mounted at the left-hand end of the panel.

Plate Milliammeter

A plate milliammeter is a mighty handy thing to have on a C.W. set, but is not an absolute necessity. It shows you how much current is flowing in the plate supply circuit, this being equivalent to the B battery circuit in a receiver. It is useful to know this because any change in the operation of the set is usually accompanied by a change in plate current and by watching the plate milliammeter you can tell whether the set is working as it should. By noting the reading of both the plate milliammeter and the antenna ammeter, you can tell roughly whether a good part of the energy supplied the set is going into the antenna, or whether it is being wasted as heat in the tube on account of incorrect adjustment of the set.

The plate milliammeter should have a scale reading 0-100 milliamperes or thereabouts. As in the case of the filament voltmeter, the plate milliammeter may be a small 98¢ pocket instrument instead of an instrument of a more expensive but better type. An 0-50 *volt* pocket meter such as is sold for testing B batteries makes a good milliammeter. When re-calibrated it will have a scale of probably 0-125 milliamperes.

Fixed Condensers

Four 2000 μμfd. (.002 μfd.) fixed condensers, capable of withstanding at least 1,000 volts are needed. One is for use as a grid condenser, one as a stopping condenser in the plate circuit, and the other two as filament by-pass condensers.

The object of the grid condenser is to provide a storage place for the charge that collects on the grid. Sometimes a C.W. set will work without a grid leak and a grid condenser, though it is almost sure to work better with them.

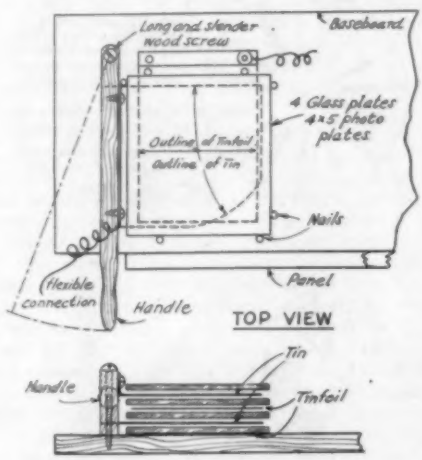
The object of the stopping condenser in the plate circuit is to prevent the plate supply current from being short circuited by the plate coil. Though the stopping condenser acts as a barrier to the plate supply current, the radio frequency current flows with ease through this condenser.

The two filament by-pass condensers have for their purpose the by-passing of the radio frequency current around the filament transformer secondary windings. The set will work without these condensers but it is bad practice not to use them. Besides which there is always the possibility of the transformer becoming damaged if radio frequency current is allowed to flow in the windings.

All four of the above condensers may be constructed from the information given in the first paragraph on page 60 of the August, *QST*. The two for filament by-pass were clamped together as one unit as pictured in the right of the photo on page 58 of the August issue.

These condensers can just as well be made with glass photo plates as the dielectric. If the plates are a trifle under 1/16 inch in thickness, as they usually are, the total active area of the dielectric should be about 75 square inches to give the right capacity. The exact number of pieces of tinfoil and glass to use will depend on the size of glass plates you intend to use. Use enough plates so that the active area of glass will be 75 square inches. The tinfoil should be cut so as to leave about a 1/8 inch margin around three edges of the glass. These condensers may be assembled in exactly the same way as were the mica ones last month, but instead of clamping between pieces of bakelite they are taped to a piece of wood with a layer of sticky friction tape as shown in Fig. 3.

Besides the four condensers just described you will need a 500 μμfd. (.0005 μfd.) condenser for the closed circuit. This should be made of glass plates and tinfoil. Four pieces of glass photo plates 2 1/2 by 4 inches (obtained by cutting two 4 by 5 plates in half) and three pieces of tinfoil 2 1/4 by 5 inches are needed. The condenser is assembled as shown in Fig. 3 and taped to a piece of wood 3/8 inch thick, 2 1/2 inches wide, and 5 1/2 inches long. The tinfoil is laid on so as to leave a 1/8



Detail of antenna series condenser

FIG. 4

inch margin on three sides. Two of the pieces of tinfoil connect to one terminal and one to the other.

Antenna Series Condenser

This condenser is connected directly in series with the antenna and should be continuously variable. An ordinary receiving variable condenser will not do unless the plates are spaced wider apart than usual. This condenser will be called upon to withstand quite high voltages at times, which will cause sparking between the plates if an ordinary variable condenser is employed. For this reason, and to keep the cost of the set low, a novel, but really effective variable series condenser was used on the set being described. It consists of a regular tinfoil and glass condenser except that one set of conducting plates is made of roofing tin or the side of a kerosene can and arranged to slide in and out of mesh with the others. The construction of this condenser is shown in Fig. 4. Four photo plates 4 by 5 inches are needed, two pieces of tinfoil 3 1/4 by 5 1/2 inches, and two pieces of roofing tin about 4 1/2 inches square before the corner is cut away as shown in the figure. The condenser is held in place by nails driven

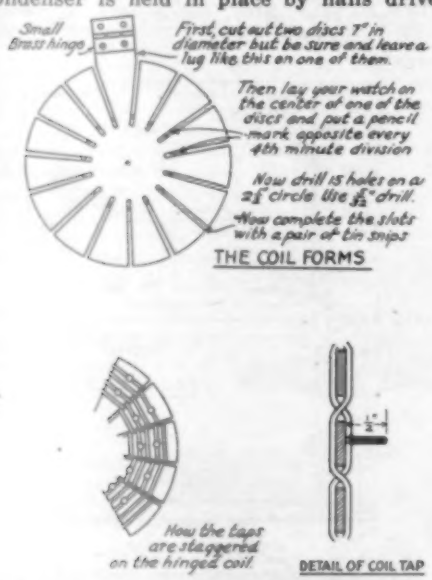

Small Brass hinge
First, cut out two discs 7" in diameter but be sure and leave a lug like this on one of them.
Then lay your watch on the center of one of the discs and put a pencil mark opposite every 4th minute division
Now drill 15 holes on a 2½" circle like ⅝" drill.
Now complete the slots with a pair of tin snips
THE COIL FORMS
How the taps are staggered on the hinged coil.
DETAIL OF COIL TAP

FIG. 5 HOW TO MAKE THE INDUCTANCES

around the edge of the glass plates. The handle protrudes around the edge of the panel for ease in making adjustments.

Inductances

Figure 5 shows the details of the inductances, of which there are two. They are wound on spiderweb forms seven inches across, made of 1/16 inch fiber. Something stiffer than ordinary cardboard is really required for these forms; perhaps good heavy cardboard might do if the fiber cannot be had. One form has a lug left on it as shown for fastening on a small brass hinge while the other is mounted to a wooden post by a screw through its center. Otherwise the two forms are similar. Each of these inductances is composed of 25 turns of No. 16 D.C.C. wire. A string is wound along with the wire for spacing the turns. Approximately 120 feet of wire will be needed. The direction of winding makes no difference. The hinged coil is tapped at every turn and the taps are staggered as shown in the figure so there will be plenty of room for the clips. The other coil has a tap brought off at every fifth turn. After bending up the taps as shown and finishing the binding, scrape the insulation from the taps and run melted solder over them to make them more solid.

Mounting the Parts

A baseboard of good clear smooth and dry lumber is needed next. The one used on the set in the photograph measures 7 by 19 inches, but one 7 by 24 inches or more is recommended as the parts would then not be so crowded. A front panel of wood three inches high is secured to the front of the baseboard to take the meters and antenna and counterpoise binding posts. Both the panel and the baseboard should be sandpapered smooth, then give a coat or two of thin shellac.

The relative position of the parts is shown in the top photographic view. A wooden post ½ by ¾ inches in cross section and eight inches long is mounted upright on the center line of the baseboard and toward the left to take the antenna coil. A phone tip binding post at the top with a No. 14 wire through it leading to the hinged inductance furnishes a convenient way of fixing the coupling at various positions. The hinge is located one inch from the wooden post so the coils will be one inch apart when they are both vertical.

Having fastened down all of the parts, you are now ready to wire the set. The diagram, Fig. 1, shows the connections. The set may be wired with bare No. 14 wire. Five flexible connections, each nine inches long, of lamp cord with clips on one end and eyelets on the other make connection to the inductances.

In Store for Next Month

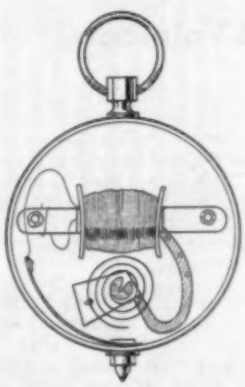
Now you have the transformer itself completed. Next month we'll settle that argument on plate supply by telling several ways of doing it. How to connect the set to the electric light mains, how to run the antenna lead-in, and how to make the necessary adjustments will be told. Some of the peculiarities and queer habits of a small tube transmitter will be discussed, besides explaining just how to get the most out of the little "ether buster." By that time you will have your transmitter license, no doubt, and will be "all set" to go.

Strays

An Inexpensive Filament Voltmeter or Plate Milliammeter

A filament voltmeter is a necessity on every C.W. transmitter, and though not quite as necessary as the voltmeter, a plate milliammeter is also useful. Outside of vacuum tubes, meters are the most expensive single items that the amateur must buy in building a small C.W. set.

Excellent substitutes for the above meters are the small voltmeters that are sold for testing B batteries, reading up to 50 volts or so, direct current. Take the battery meter to a friend's station and re-calibrate it by comparison with his more expensive instruments. To calibrate it as milliammeter, connect your meter in series with his and note the position of the pointer on your



meter for various values of current through his meter. To calibrate the battery meter as an A.C. filament voltmeter, it is best to get one that reads only up to ten or twenty volts, D.C. Proceed with the calibration the same as for the milliammeter, except connect the battery meter across your friend's A.C. filament voltmeter and calibrate on alternating current. You can put a new paper scale on the battery meter, showing these new readings, if desired.

The battery meter as purchased will not read accurately on A.C., and probably not any too accurately on D.C., so it should be re-calibrated. As an example, a pocket voltmeter reading up to 50 volts, was re-calibrated and now reads up to 250 milliamperes. The plunger type of meter, shown in the sketch, should be used. These meters cannot be used as antenna ammeters, however, as they are unsuitable for use in radio frequency circuits.

—9ASW.

Amateur Emergency Work

Several amateurs have been wondering if they would be censured for transmitting during the quiet hours in cases of emergency. Some have even decided they would not take part in emergency work because of the risk attending violation of the quiet hour rule. In this connection, the following paragraphs from a recent letter from the Commissioner of Navigation at Washington, D. C., will be of interest.

"In cases of emergency where the public would be benefited the Bureau desires the amateurs to be of service to their community and while it is of course in the interest of good discipline that the Supervisor of the district be kept in touch with such conditions at the same time emergencies may occur when it would not be possible to communicate with the Supervisor or where time would not permit such action and in such cases if the amateur uses good judgment and coöperates to the extent of giving the services of his station to relieve the emergency situation, even though he may not have the authority of the Supervisor, such action could not in justice be charged to the amateur as an infraction of the regulations. In fact, in most cases there is a possibility that the act would be made a part of his record indicating commendable service.

"It is not the desire of the Bureau to in any way handicap the amateurs in giving voluntary service during emergencies and every encouragement should be given to their undertaking this work whole heartedly."

How would you like to have an A.R.R.L. emblem engraved on the panel of your receiving set or transmitter? This sounds like a fine idea. Mr. A. L. Woody of Home-

wood, Illinois, will be glad to tell you more about the work he is doing for the hams along this line.

The patents and trade name on the Horne "Verni-tuner" described on page 50 of the June 1924 *QST* have been purchased by the Electrad Company, Inc., 428 Broadway, New York City, New York, who are now manufacturing this useful little device under the name of Electrad Verni-tuner.

The Southern California Radio Association, by a vote of 5 to 1 has, in their section, voted out all spark, A.C.C.W., I.C.W. all rectified A.C.C.W. which does not come within the traffic officer's idea of the 5% modulation clause and all phones not employing the Carson system of modulation*. It has also voted out all conductively coupled circuits and has recommended that coupling be used as loose as possible. In return, the Association is asking if it is possible that the quiet hour band be lifted. The movement has the approval of the sixth district Supervisor of Radio and is being taken up with Washington.

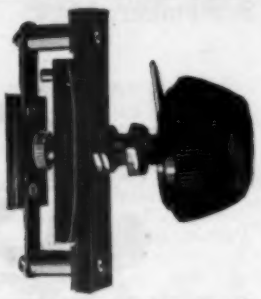
Another good amateur "stepped off" on June 30th, when Leo Clifford ("Droopy") Young and Mabel Claire Carleton were married in Washington, D.C. Mr. Young is well known throughout the amateur fraternity as the right hand man at the Navy's pioneer short wave tube transmitting station, formerly NSF, then NOF, and now NKF. Their many friends unite in wishing the pair every happiness.

Many times people who don't know us get the name of the A.R.R.L. all mixed up, but we believe 4PL did it intentionally when he called us the "American Radiogram Rushers League." Alas! If it were only true.

"What a pity to let so much sheet copper go to waste when we have oodles of amateurs who need good ground systems" said Rip Bennett the other day, as he gazed longingly at the great pile of copper stills, urns, tubing, etc., piled up against the side of the jail and courthouse at Dallas, Texas.

Wilbur C. Gross, 8ZK, tells of an experience he recently had that should be a caution to the rest of the gang. While charging a 100-ampere-hour glass-encased storage battery at about eight amperes, gas collected in the bottom of the cell and caused it to explode, throwing glass and acid in all directions. Fortunately, no one was hurt. Though this is an unusal case, it always pays, no matter how small your storage battery, to be sure that the vents are open before charging. Keep fire away from storage batteries that are on charge also; the gasses given off are very explosive.

*We are not acquainted with this system and are therefore unable to print any information on it.—Ed.



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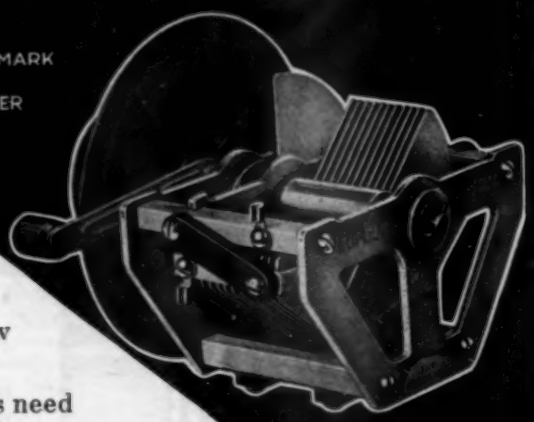

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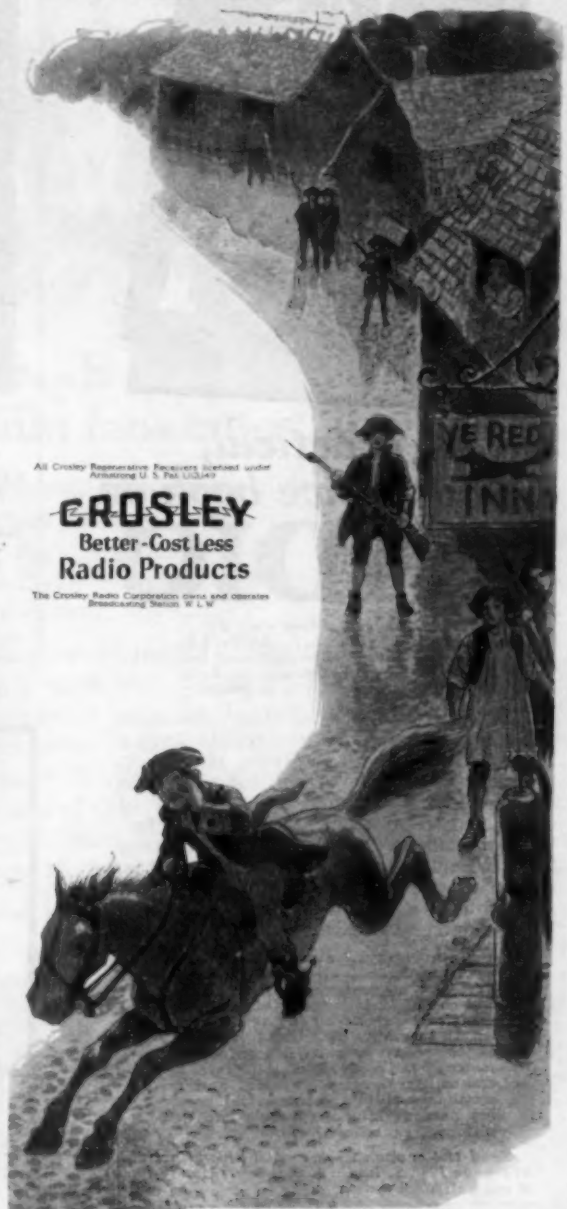

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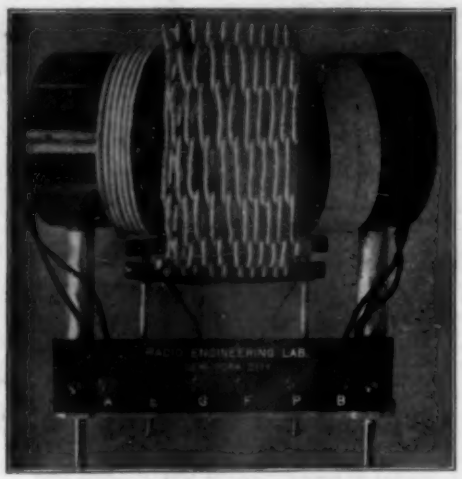

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Mfrs. of special tools, dies, jigs automatic machinery and sub presses.

Why thousands of radio fans enjoy him

Because thousands of storage batteries are on the job, brimful of energy, gaining clear, satisfying radio reception for every word and inflection.

With a Tungar, the carefree battery charger, in your home you can keep your battery tuned up to get every single note of music, every recitation, speech or song. Tungar charges the battery overnight from the house current.

Sold by Electrical, Auto-accessory and Radio dealers.

Tungar is one of the many scientific achievements contributed by the G-E Research Laboratories toward the wonderful development of electricity in America.

Tungar Battery Charger operates on Alternating Current. Prices, east of the Rockies (60 cycle Outfits)—2 ampere complete, $18.00; 5 ampere complete, $28.00. Special attachment for charging 12 or 24 cell "B" Storage Battery $3.00. Special attachment for charging 2 or 4 volt "A" Storage Battery $1.25. Both attachments fit either Tungar.

Tungar
REG. U.S. PAT. OFF.
BATTERY CHARGER

Tungar—a registered trade mark—is found only on the genuine. Look for it on the name plate.

Merchandise Department
General Electric Company
Bridgeport, Connecticut

GENERAL ELECTRIC

48 E-10

A quality plug that adds refinement to any radio set

75¢ EVERYWHERE

WESTON ELECTRICAL INSTRUMENT CO., 158 Weston Ave., Newark, N. J.

Electrical Indicating Instrument Authorities Since 1888

WESTON

STANDARD - The World Over

A.R.R.L Members -- What about your friends?

You must have a friend or two who ought to be members of our A.R.R.L., but aren't. Will you give us their names, so that we may write to them and tell them about the League and bring them in with the rest of us? The A.R.R.L. needs every eligible radio enthusiast within its ranks, and you will be doing your part to help bring this about by recommending some friends to us. Many thanks.

.....1924

American Radio Relay League,
Hartford, Conn.

I wish to propose

Mr..... of.....

Mr..... of.....
Street & No. Place State

for membership in the A.R.R.L. I believe they would make good members. Please tell them the story.

.....

.....

Now a MAGNAVOX Radio Tube

INTO the design of this new Tube have gone over two years' research and experiment along original lines, culminating in discoveries which made possible an entirely new principle of tube construction.

One trial convinces the most exacting user that the Magnavox will replace ordinary tubes to great advantage in any receiving set.

Magnavox Radio Vacuum Tube Type A is a storage battery tube for use as audio frequency and radio frequency amplifier in all standard circuits. Highly recommended also for detector use.

This tube is not critical of adjustment either as to plate or filament. Filament consumption one quarter of an ampere. $5.00

Magnavox Radio Tubes and other Magnavox Products are sold by reliable dealers everywhere

THE MAGNAVOX COMPANY

New York Oakland, Calif. San Francisco

Canadian Distributors:
Perkins Electric Limited, Toronto, Montreal, Winnipeg

9R

A Whirlwind Success!

AMERICAN BRAND CONDENSERS

with the **100 to 1 Worm Drive**

23 Plate, only $5.00

These Condensers are now ready for you. Jobbers and dealers everywhere should have them to fill the public demand.

American Brand Condensers are made with the highest ratio geared adjustment ever developed on variable condensers. They are without question the *Lowest Loss* condensers available today. Their price is *no* higher than the price of ordinary condensers.

Please ask your dealer to show you this condenser—if he can't do so, write us for a descriptive folder and send us your dealer's name.

Note to Dealer: If your jobber can't supply you, write us—

American Brand Corporation
8 West Park St., Newark, N. J.
Factory—Philadelphia

Don't Guess

Equip your set with a *real* voltmeter—the *Roller-Smith* Radio TD.

Set it in the panel, connect it up and see *right before you, all the time,* the exact A and B battery volts.

Its price is reasonable and it will save its cost many times over.

Send for Bulletin AG-10 and look on page 5.

ROLLER-SMITH COMPANY
16 PARK PLACE, NEW YORK
Offices in principal cities in U.S. and Canada

Use HOMMEL SERVICE *to build your radio business*

Hommel Service may be likened to a business "contractor." Brick by brick it erects a sturdy structure of radio business—a business that will very soon march shoulder to shoulder with the selling of phonographs.

Every music dealer is the logical outlet for radio supplies. This organization is your logical radio distributor. Our wide experience in this field and an almost inexhaustible stock of nationally known radio supplies, together with our liberal discounts and policy of wholesaling only is proof of that statement.

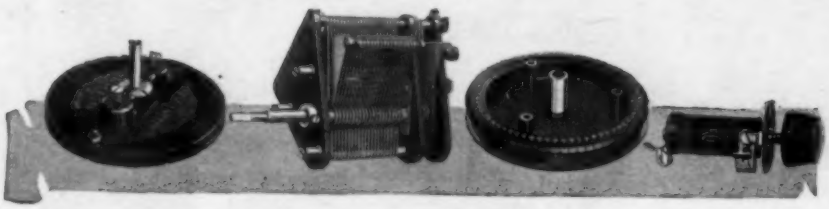
Our Dealer's Service Department too is always at the command of all Hommel Dealers.

Write for Hommel's Encyclopedia of Radio Apparatus No. 256T

LUDWIG HOMMEL & CO.,
929 Penn. Avenue
PITTSBURGH, PENNA.

BAKELITE

TRADE MARK REG. U. S. PAT. OFF.



Standard Insulation —wherever Dials turn

With every facility for testing materials used in radio work, the United States Signal Corps chose Bakelite for the potentiometer base here shown. We also illustrate a Rogers Radiometer, Kellogg Condenser and Fil-Ko-Stat, all of which are Bakelite Insulated.

These critical radio experts, as well as the most inexperienced amateur, have come to recognize the phrase "Made of Bakelite" as a guaranty of excellence in radio insulation.

Bakelite enhances the value of any radio set. Its high electrical resistance, stability and beauty of finish have led to its adoption as standard insulation by the large majority of radio manufacturers.

Send for a copy of our Radio Booklet C

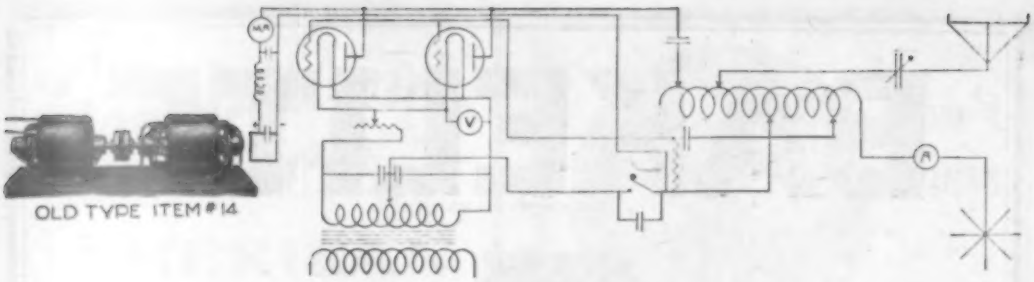
BAKELITE
Condensite
REDMANOL
are the registered Trade Marks for the Phenol Resin Products manufactured under patents owned by
BAKELITE CORPORATION

Send for our Radio Map

The Bakelite Radio Map lists the call letters, wave length and location of every broadcasting station in the world. Enclose 10 cents to cover the cost and we will send you this map. Address Map Department.

BAKELITE CORPORATION
247 Park Avenue, New York, N. Y.
Chicago Office: 636 West 22d Street

THE MATERIAL OF A THOUSAND USES



1 AXN—Using **OLD TYPE ITEM No. 14 (Four years old), with 2-50 watt tubes, Hartley Circuit on schedule—April 26, 27, 28, worked British 2 NM.**

This is but one of the many instances of "ESCO" products—consistency—dependability and durability.

For maximum miles per watt try "ESCO."

Write for Bulletins 237B and 242 B listing over 200 combinations.

TRADE **"ESCO"** MARK

ELECTRIC SPECIALTY CO.

225 SOUTH STREET — STAMFORD, CONN., U. S. A.

Pioneers in Developing and Perfecting High Voltage Radio Apparatus

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"Rolls Royce" Radio Tubes

Like their name significant of QUALITY. A powerful and durable tube that will greatly improve reception. Increases range and volume with a maximum of clearness. Our direct sales plan enables you to buy "Rolls Royce" at the lowest possible price.

Type 200.....**5 volts, 1 Ampere Detector Tube**
Type 201A.....**5 volts, .25 Ampere Amplifier and Detector**
Type 199.....**3-4 Volts, .06 Ampere Amplifier and Detector**
Type 199A.....**3-4 Volts, .06 Ampere with Standard Base Amplifier and Detector**
Type 12 .....**1½ Volts, .25 Ampere Platinum Filament Amplifier and Detector.**

"The Rolls Royce of Radio Tubes" **ALL TYPES** **$2.50**

Type 202.....5 Watt, Transmitters, $3.00

EVERY TUBE GUARANTEED

to work in Radio Frequency, especially adapted for Neutrodyne, Reflex and Super-Heterodyne Sets.

Shipped parcel post, C.O.D. When ordering mention type.

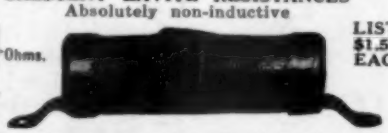
ROLLS ROYCE TUBE CO.,
21 Norwood St., Dept. S. Newark, N. J.

RADIO BROADCASTING STATION FOR SALE

Having installed new equipment using water cooled tubes we offer for sale our former KFKB 500 watt set. As good as any 500 watt set using air cooled tubes. Sending radius as much as 8,000 miles. We were heard in Montevideo, Uruguay and other equally distant points while using this equipment. Write for particulars.
THE BRINKLEY JONES HOSPITAL ASS'N.
MILFORD, KANSAS

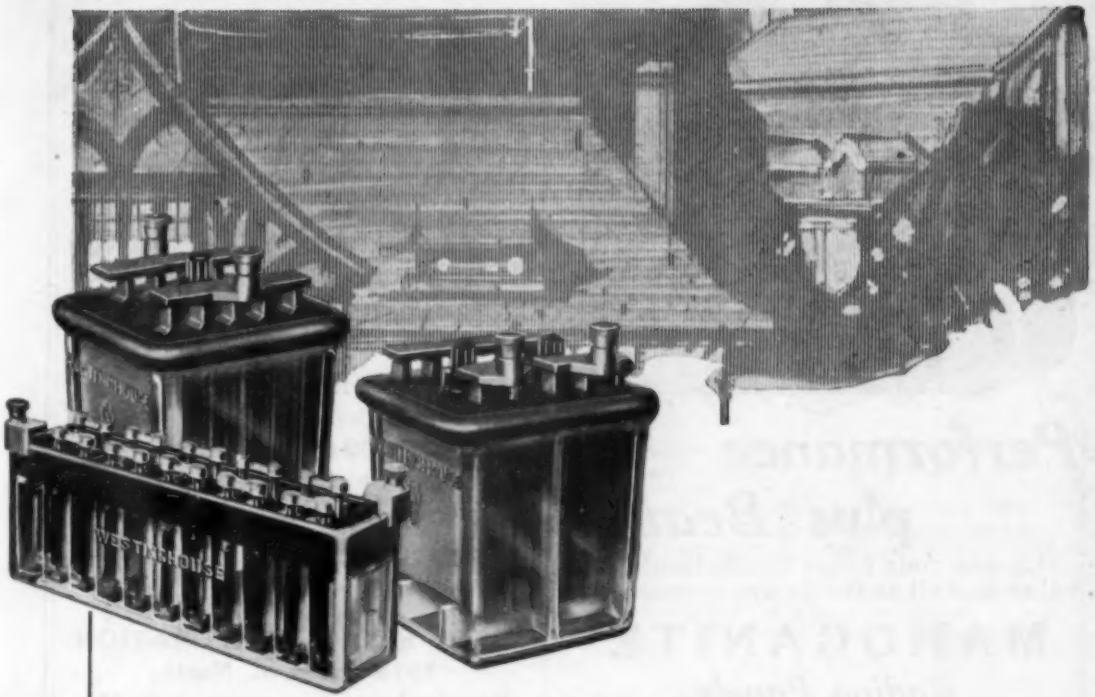
CRESCENT LAVITE RESISTANCES
Absolutely non-inductive

12,000
40,000
50,000
100,000 } Ohms.



LIST $1.50 EACH

Special resistances to order. Used in all circuits.
Dealers write for discount.
CRESCENT RADIO SUPPLY CO.
1-3-5 Liberty St., Jamaica, N. Y.



FULL voltage battery current all the time! That's what you want. Westinghouse Radio Storage Batteries will give it to you. No more operating with run-down batteries! No more sudden drops in battery voltage! No more throwing away worn-out batteries! Westinghouse Batteries last. They hold their charge. They can be easily recharged. There's a size and type for every radio need. Built by Westinghouse, you *know* it's RIGHT!

Westinghouse CRYSTAL CASE Batteries have one-piece clear glass cases, with solid glass cell partitions and high plate rests (deep sediment spaces). Perfectly insulated against current leakage. "A" Batteries. 2 volts, for low-voltage tubes, such as WD-11 and WD-12. 4 volts, for tubes like UV-199. 6 volts, for tubes UV-201A or C-301A. Also rubber-case types. "B" Batteries. 22 volts. Regular and quadruple-capacity types. "C" Batteries in 6-volt units.

WESTINGHOUSE UNION BATTERY CO., Swissvale, Pa.

WESTINGHOUSE
RADIO
"A," "B" and "C"
BATTERIES

Performance plus *Beauty*

Choose your panel for its insulating value as well as for its appearance.

MAHOGANITE

Radion Panels

give you both the supreme insulation and the beauty of polished mahogany. For Mahoganite is not a surface finish but an insulating material which extends from one side of the panel to the other.

21 Stock Sizes

Mahoganite and Black

6 x 7	7 x 14	8 x 26
6 x 10½	7 x 18	9 x 14
6 x 14	7 x 21	10 x 12
6 x 21	7 x 24	12 x 14
7 x 9	7 x 28	12 x 21
7 x 10	7 x 30	14 x 18
7 x 12	7 x 48	20 x 24

RADION

The Supreme Insulation

PANELS

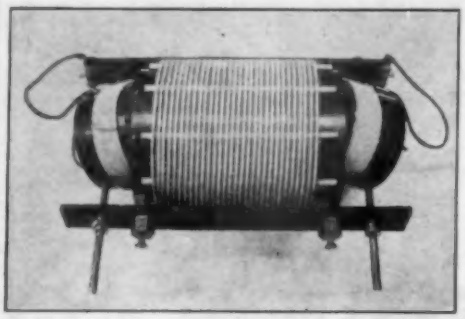
Look for this stamp on every genuine RADION panel. Beware of substitutes and imitations.

At the best radio shops or write to

AMERICAN HARD RUBBER CO.

11 MERCER STREET NEW YORK

See our exhibit at the FIRST RADIO WORLD'S FAIR, Madison Square Garden, N. Y. — SEPT. 22-28th, 1924.

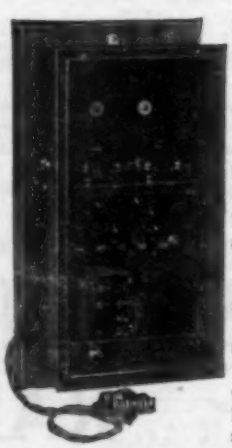


Cover the new amateur wave bands with the LOW LOSS cast type 200 to 600 Meters. Price Tuner. 80 to 215 Meters. Broad- \$7.00 each.

Used at 5AMH, 5ZAS, 5OM, 5BP, 5ACM, 5WS, 5MI.

BELL RADIO CORPORATION
1913 5th Ave. North,
Birmingham, Ala.

WHAT IS YOUR "B" BATTERY COST?



The Kellogg Trans-B-former furnishes necessary plate voltages from your 110 AC, 60 cycle electric light socket at the lowest possible cost and with better reception.

This noiseless "B Battery" supply assures constant voltages at all times. Arranged for detector (0 to 35 volts) 45, 90 and 130 volts.

Positive in operation and one of the biggest advances in radio today.

At your Dealers, \$50.00

KELLOGG SWITCHBOARD & SUPPLY COMPANY
1066 W. Adams St., Chicago, Ill.

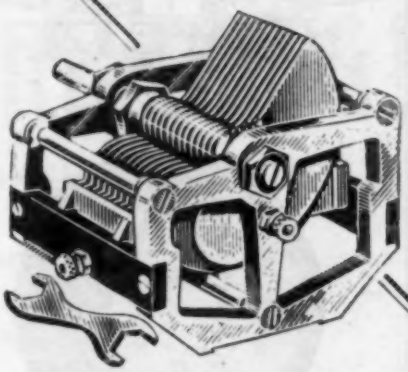
Here's a laboratory condenser at a commercial price

The only straight line wave length low loss condenser

Light in weight—compact in size—aluminum frame and plates.

Radio men all over the country have pronounced this new Bremer-Tully "Lifetime" condenser to contain more vital improvements, more essential advantages, than any other.

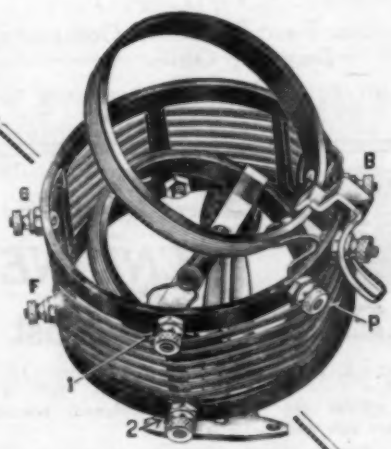
You'll find it electrically perfect—mechanically beyond comparison.



7 plate	$4.25	23 plate	$5.00
11 plate	$4.50	35 plate	6.50

This is the condenser radio fans have longed for, but never before been able to obtain outside the extremely high price laboratory types.
No matter what circuit you're using, this B.T. Condenser will improve it.
Write for "20 Point" folder. It gives the details.

BREMER TULLY LEADS AGAIN
with a real low loss Tuner.



Low dielectric losses. Windings are supported with the least possible insulation. COIL FRAME OF BUREAU OF STANDARDS TYPE.

Adjustable Untuned Primary meets the great problem of the past,—that of adapting a tuner to the various types of antennae, circuit requirements, and local receiving conditions.

A new adjustable lubricated cone bearing.

Binding posts arranged for minimum dielectric loss and supplied with tinned soldering lugs.

Adaptable to any circuit requiring a tuner.

Ranges covered with B-T 11 plate Laboratory Condenser.

Two types: Short wave work 50 to 160 meters (space wound).
Broadcasting 200 to 565 meters spaced series banks.
Price $5.00

"Better-Tuning" (now in 6th Edition) Tells you why, shows you how. Contains complete instructions and diagrams for progressive construction from crystal to Reflex and Radio Frequency circuit. Packed with each tuner free or mailed on receipt of 10c.

BREMER-TULLY MFG. CO.
531 S. Canal St. Chicago

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IT HAS BEEN SAID–

A and B Battery Voltmeter No. 57

¶ "That over 60% of all Radio trouble is traceable to poor or run-down batteries."

¶ Our No. 57 has been designed to meet the demand coming to us from serious experimenters for an accurate all around semi-portable instrument for battery, filament and grid voltage tests.

¶ Jewell Instruments lead in the Radio field. They are fully illustrated with diagram connections, in our 15-A radio catalog.

Order from Dealer

Jewell Electrical Instrument Co.

1650 Walnut St. - Chicago

"25 Years Making Good Instruments"

The Model OEM, DAY-FAN Receiving Set

Model OEM-7, Four Tube—$98.
Model OEM-11, Three Tubes $90

This set is worthy of your immediate attention.

It has the Duo-plex circuit developed in our laboratories. So perfectly balanced is this set that the dial settings are the same EVERYWHERE, EVERYTIME. It has a very low maintenance cost. Write today for full particulars.

The Dayton Fan & Motor Company, Dayton, Ohio.

Manufacturers of high-grade electrical apparatus for 35 years.

NA-ALD

Super DeLuxe Dial Price 75¢

A BEAUTIFUL CREATION

Scientifically determined graduations. Test with any other dial and see how much more quickly you can turn to a degree or fraction of a degree. Genuine Bakelite. See display board at your dealer's.
2" Rheostat dials 35c—3" regular 35c, 3⅞"—50c
ALDEN MANUFACTURING CO.
Dept. M. Springfield, Mass.

EBY +

There is only one

GENUINE

EBY Binding Post

"with Tops which don't Come Off".

EBY Posts are scientifically designed, beautifully finished and their price is right.

EBYS are Binding Posts PLUS.

H. H. EBY MFG. CO., Philadelphia

HERE YOU ARE GANG!

Just What You Have Been Waiting For!

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A.R.R.L. OHIO STATE CONVENTION

To be held in

CINCINNATI, OHIO

FRIDAY, SATURDAY AND SUNDAY

SEPTEMBER 26th, 27th, and 28th

Under the auspices of the

UNION CENTRAL RADIO ASSOCIATION

Everything for the Ham—Trips, Talks, Technical Discussions, Exhibits, Banquet, R. O. W. H. Initiation, Contests, License Examinations, Oodles of Stunts, Ham Stations—and——Oh! Well come to Cincy and see for yourself.

Ask your Ticket Agent for Half-Fare Return Coupon.
Send your reservation now, or write for futher information to

Elmer H. Schubert—8ALW, General Chairman
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Union Central Bldg. **Cincinnati, Ohio**

Growth

AS a picture grows to completion under the hand of an artist, so has the world's favorite audio transformer grown under the development of its engineering staff. Soundly designed, it requires no yearly remodeling. Day by day it is brought nearer to perfection; a little refinement of winding here, a little more costly material there—the increased cost perhaps balanced by the adoption of some labor-saving tool, rendered economical by enormous output.

All-American Audio Transformers come in these ratios:

Type R-12 (3 to 1) $4.50

Type R-21 (5 to 1) $4.75

Type R-13 (10 to 1) $4.75

In a word, the All-American you bought two years ago, unsurpassed as it was at that time, is overshadowed in perfection of performance by the All-American of the present day as the strength of a child is exceeded by that of a grown man.

Continuing, without radical change, the present standard All-American models (Audio, Power, Long-Wave) we shall announce, during the months of October and November, achievements in the art of transformer building, surprising in their perfection even to those long familiar with All-American superiorities.

The Radio Key Book Is Out!

The most valuable radio reference book you can own. It tells how to hear farther and better; all the more workable circuits are clearly pictured, diagrammed, and explained. Practical suggestions on how to get best results from the set you have. Send 10 cents for it today, coin or stamps.

RAULAND MFG. COMPANY

2642 Coyne St., Chicago

PIONEERS IN THE INDUSTRY

ALL-AMERICAN

AMPLIFYING TRANSFORMERS

Largest Selling Transformers in the World

Some Pippin!

A Celoron Radio Panel gives a snappy, professional appearance to the home-built set. Its high dielectric strength helps instruments give the best results. Celoron, a bakelite material is approved by the U. S. Navy and Signal Corps and used by leading radio manufacturers.

Celoron panels come *in nine standard sizes*, in black, mahogany or oak. Other sizes cut to order. *Ask your dealer.*

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Bridgeport, Pa., Chicago, Ill.

Branches in Principal Cities

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Break-In Relays

FOR SHIPBOARD

Model 18 Type S 1, 6 volt

$23.00

Model 18 Type S 2, 120 volt

$25.00

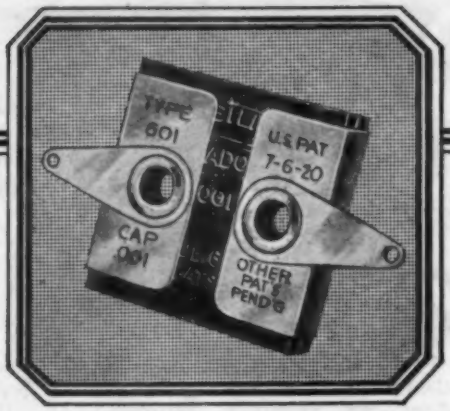
FOR THE AMATEUR TUBE TRANSMITTER

Model 24 Type S 1, 6 volt

$16.50

LEACH RELAY CO.

507 Mission St., San Francisco



MICADONS

CONDENSERS OF FIXED AND PERMANENT CAPACITY

You will have condensers that maintain capacity if you buy Micadons.

These accurate Dubilier Micadons are found in over ninety per cent of the sets made by amateurs and manufacturers throughout the country. The experts specify Micadons.

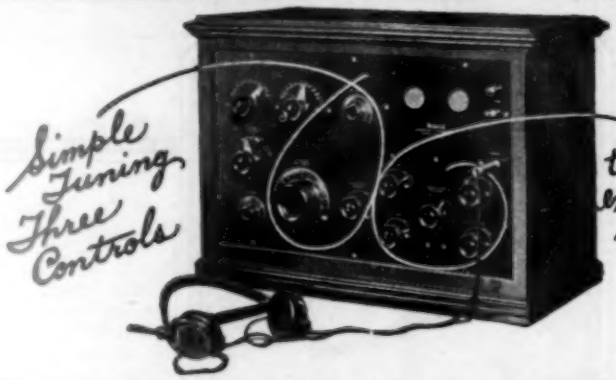
The name Dubilier on a condenser has the same meaning as the name Sterling on Silverware—highest quality.

There is a Micadon for every circuit—different types are made for different requirements.

For free booklet showing method of soldering Micadons in radio circuits, address: 45-49 West 4th Street, New York.

Dubilier

CONDENSER AND RADIO CORPORATION



USERS enthusiastically proclaim the Federal "Fifty-Nine" as "Federal's Finest". The "Fifty-Nine" represents the accomplishment of an ideal after over a quarter century's patient striving. It gives all the beauty of Federal Tone, Selectivity and Distance Range, *plus* a simplicity of operation that opens the real thrills of radio to novice and professional alike.

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BUFFALO, N. Y.

Boston New York
Philadelphia Chicago
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Federal
Standard RADIO Products

Priced at
$177
With headphones.

For loop reception
(No. 61)
$46 Extra

WE REPAIR THE FOLLOWING

RADIO TUBES

and Guarantee Them

WD-11	$2.50	DV-6A	$2.50
WD-12	2.50	UV-199	2.50
UV-200	2.50	C-299	2.50
UV-201	2.50	UV-201A	2.50
C-300	2.50	C-301A	2.50
C-301	2.50	Marconi	2.50
DV-6	2.50	Moorhead	2.50
DV-1	2.50	6 v. Plain Detector	2.50
DV-2	2.50	6 v. Plain Amplifier	2.50

Mail Orders solicited and promptly attended to.
Dealers and Agents write for Special Discount

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Original TOAZ { TERMINALUGS, BUS BARS, STAMPINGS

Terminals of Pure Copper.
— TINNED —
For Better and Easier Soldering.

— AMATEUR SPECIAL —
50 Terminalugs — Post Paid — 25c
Fit No. 6 or No. 8 Screw.

Discounts to Dealers. || Free Pamphlet Practical Soldering

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Ask Your Neighbor

THE name **FROST-RADIO** on a piece of apparatus, whether **FROST-FONES**, Plugs, Jacks, Sockets, Rheostats, etc., means highest quality. Your dealer carries complete stocks. See him today.

HERBERT H. FROST, Inc., 154 W. Lake Street, Chicago

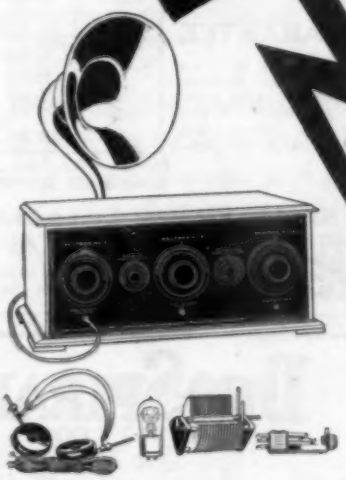
Radio Headquarters

Everybody is interested in Radio. If you would keep in step with the progress that has been made in this greatest of all discoveries, you should have our NEW RADIO Catalog just now off the press.

You can get the latest and best equipment from RADIO HEADQUARTERS. We have everything that anybody needs to enjoy the entertainment, news and education that are waiting to be brought right into your home.

Don't be without the comfort of Radio this fall and winter when reception is so fine.

The World's Largest Store—RADIO HEADQUARTERS—can save you money on everything you need.



The World's Largest Store is RADIO HEADQUARTERS. Here you can get the famous SILVERTONE neutrodyne receiving set or the smallest radio part—at the lowest prices in America.

Mail the coupon TODAY to the store nearest you. 62Q71.

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Chicago Philadelphia Dallas Seattle

Send New Radio Catalog.

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Postoffice..... State.....

Rural Route..... Box No.....

Street and No. .....

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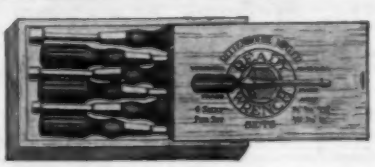
The Worlds Largest Store owns and operates Station W.L.S. Wavelength 345 Meters. Tune in



READY-WRENCHES

Best Socket Wrench Value!

Just what you've been waiting for. A set of six socket wrenches in radio sizes—¼" to ½"—with full handle *on each*. Hollowed stems. Accurate hexagon heads. Packed to last, in a strong **wood** box with sliding cover. Get this new service box at the new low price—and forget your wiring trouble.

$1.25

$1.35 West of the Mississippi

If your dealer hasn't it—send check or M.O. direct to us with your dealers name.

RITTENHOUSE MFG. CO.

90 MECHANIC St. WORCESTER, MASS.

FRESHMAN

Noiseless Tested Mica Condensers

maintain their fixed capacity due to scientific design and construction in which constant equal pressure is exerted on the condenser plates over the entire area; making the Freshman condensers the only ones that avoid noises due to variable pressure on the plates. A metal casing protects the plates and reduces hysteresis losses to a minimum.

Capacity	Each	Capacity	Each
.00005	$0.35	.0025	$0.50
.0001	.35	.003	.60
.00015	.35	.0035	.70
.0002	.35	.004	.75
.00025	.35	.005	.75
.0003	.35	.006	.75
.00035	.35	.0075	1.00
.0005	.35	.008	1.00
.0006	.40	.009	1.00
.0008	.40	.01	1.00
.001	.40	.015	1.50
.0015	.40	.02	2.00
.002	.40	.025	2.50

Exclusive Features of Freshman Noiseless Tested Mica Condensers

1. No losses through di-electric hysteresis of fibre covers.
2. No insulating binder to melt at the application of heat and by releasing pressure, change the capacity.
3. Capacity fixed and invariable.
4. Metal case protects against accidental injury.
5. Direct connection to copper plates avoids losses through inefficient eyelet contact.
6. Application of soldering iron does not affect condenser.

At your dealers — otherwise send purchase price and you will be supplied postpaid.

Chas. Freshman Co. Inc.
Radio Condenser Products
106 Seventh Ave., New York

100 Volt Type

YOUR MONEY BACK IF YOU'RE NOT SATISFIED WITH KIC-O

We have thousands of unsolicited letters of recommendation. KIC-O "B" batteries will make good for you, too. Life unlimited. Not harmed by short circuiting, overcharging, idleness. Panel switches give single cell variations. Recharge from any 110-volt A.C. line with small home-rectifier. Charge lasts 3 to 6 months in detector plate circuit.

GUARANTEE

Your money back on any KIC-O Battery if not satisfied within 30 days. Write for full information on "A" and "B" Batteries.

Volts	Price Plain	With Panels
22	$5.50	$.....
32	7.25	11.75
48	9.50	14.00
68	12.50	17.00
100	17.50	22.50
145	23.50	28.50

Mounted Rectifier.....$2.50
Unmounted Rectifier...$1.00

Kimley Electric Company, Inc.
2666 MAIN STREET, BUFFALO, N. Y.

KIC-O — Storage "B" Batteries—long service, low cost.

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FOLDING LOOP

Compact, convenient and self contained. Increases selectivity. Reduces static. No outside aerial or ground wire necessary. Can be used *anywhere*. Has swivel base graduated for calibration. Handle permits adjustment without body capacity effects. Fine silver and mahogany finish. Made by the manufacturers of TINY-TURN the superior vernier control. Write us direct, if your dealer is unable to supply you.

RADIO UNITS INC
1304 First Ave., Maywood, Ill.

Watch for

N&K
Imported
LOUDSPEAKER
TYPE W

Announcement in the September magazines. New in principle, new in shape, new in quality of reproduction.

Made by the makers of the famous N & K Head Set, Model D, 4000 ohms.

Th. GOLDSCHMIDT CORP.
Dept. Q9 15 Williams St., New York

To Our Readers Who Are Not A.R.R.L. Members

Wouldn't you like to become a member of the American Radio Relay League? We need you in this big organization of radio amateurs, the only national amateur association that does things. From your reading of *QST* you have gained a knowledge of the nature of the League and what it does, and you have read its purposes as set forth on page 6 of every issue. We would like to have you become a full-fledged member and add your strength to ours in the things we are undertaking for Amateur Radio, and incidentally you will have the membership edition of *QST* delivered at your door each month. A convenient application form is printed below—clip it out and mail it today.

.....1924

American Radio Relay League,
Hartford, Conn.

Being genuinely interested in Amateur Radio, I hereby apply for membership in the American Radio Relay League, and enclose $2 in payment for one year's dues. This entitles me to receive *QST* for the same period. Please begin my subscription with the.....issue. Mail my Certificate of Membership and send *QST* to the following name and address.

.....

.....

.....

Station call, if any.....

Grade Operator's license, if any.....

Radio Clubs of which a member.....

Do you know a friend who is also interested in Amateur Radio, whose name you might give us so we may write to him about the League?.....

.....Thanks.

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What a delight to get some surprisingly far away station; its program coming in with clear, natural tones. You can do it with

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HEAD SETS and LOUD SPEAKERS

These instruments have powerful magnets giving great sensitivity and the finest tonal quality.

They have layer wound and layer insulated coils—a feature exclusive to Stromberg-Carlson apparatus. They stand up under high voltage and maintain their excellence indefinitely.

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No. 2A Head Set

No. 1A Loud Speaker

STROMBERG-CARLSON TELEPHONE MFG. CO.
ROCHESTER, N. Y.

Gentlemen:—

Rec'd my "HAM SPECIAL". It arrived promptly and in excellent packing. Set was put together and hooked up in about four hours time and started to pull in the old DX the first time filaments were lighted.

Two houses away, 1-BWV-20 watts rect. and unfiltered A.C., used to flip my tubes from 0-100 on tuner. Can now work within 5 meters of his wave without trouble using "CARCO".

Seven streets away, 1AWW anywhere from 10-100 watts with—Storage B. Plate Supply. Key clicks kill everything with—tuner. Can now work 3 meters away from him with "CARCO".

Would not part with "CARCO" for a Superhet. It is simple to work and with one step of audio it wrecks the old Brandes Navies on all 9 districts.

S. A. BURNETT, 1 AIN,
85 Sherman Street, Springfield, Mass.

"CARCO"
HAM SPECIAL

SHORTWAVE-LOW LOSS COUPLER

DESIGNED BY A HAM FOR HAMS

A compact unit in a space of only 3"x5½". Antenna Rotor and secondary Stator designed for "Low Loss" and "Low Resistance."
Our special single layer, multiple wound inductance does the trick.
A "Low Loss" Condenser for secondary is the only addition required for a complete tuning unit.
DX work requires a "Low Loss" tuner. Rebuild your set with a "CARCO" Ham Special. An increase in efficiency will result.

PRICE $8.00 EACH

SPECIAL PRICE TO HAMS ONLY, $5.00

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SET MANUFACTURERS and DEALERS:—We specialize on Couplers R.F. Transformers and inductances. Let us know your needs and we will design the tuner for the desired circuit.
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2"x3"—Best ever—List $3.00 Ea. Send for one.

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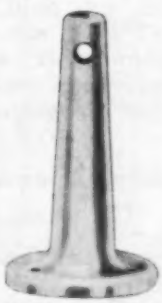

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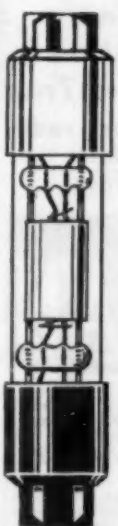

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Two types: for dry and storage batteries. Complete, ready to mount and absolutely guaranteed.

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WEIGHS ONLY 8 OZ

Perfect Tone Mates

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TYPE AF-7 is now offered as a companion transformer to AF-6 (Turn ratio 5), for second or third stage amplification. In this use AF-7 decreases the tendency to overload the last amplifying tube on loud signals.

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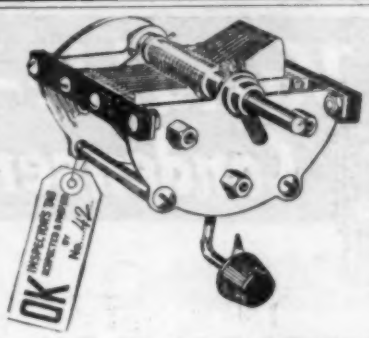

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13 plate	cap. 00025	$5.50
18 plate	cap. 00035	5.75
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Price without Vernier $1.00 less

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So perfect in design, fabrication, and *results* that it instantly brings to mind the accuracy and precision of a Swiss Watch. Every official test has given the continental Lo Loss rating equal to that of the finest laboratory instruments.
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All tubes guaranteed. Sent C.O.D.
Special proposition to dealers

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LOUD SPEAKER

This is known everywhere as the Loud Speaker with the quality tone. Not only is the tone natural and without mechanical distortion, but is sufficiently big in volume to be easily heard in a large room or all through the house. Comes to you ready to use—no auxiliary batteries are required.

Made in three models:

Audiophone Senior
Price $30.00

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Bulletin AX-3014 describes these Loud Speakers.

This is the Baby Audiophone equipped with the Fiber Horn which is now standard and supersedes the metal flare previously used. **Price $12.50**

THE BRISTOL COMPANY
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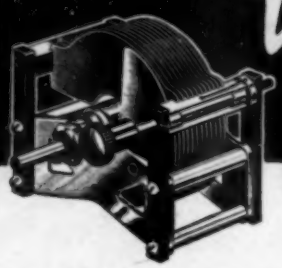
HICO Variable-Condenser



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The HICO is our newest development in condensers, and is the result of the combined efforts of five engineers whose experience covers every phase of radio work.

All brass plates, adjustable cone bearings, panel and table mount, one and three hole mounting, adjustable to any position, low loss, carefully soldered and insulated and,

Noiseless Cam Vernier on Stator Plates

This new feature allows the minutest adjustments and eliminates the noise common to rotor plate vernier.

Beautifully made in four capacities

11 plate	.00025	mfd	$4.50
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23 plate	.0005	mfd	5.00
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Made with cam vernier as price without would be the same, and it operates as plain condenser as well. At all good dealers or sent on receipt of price. Try the HICO, you'll like it. Good for any type circuit.

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The Aristocrat of Amplifiers

Quality in Radio is No Less Marked Than Quality in people. The Resistance Coupled Amplifier is a Quality Product.

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3-Stage $13.50
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KITS without sockets and condensers.

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"HEGEHOG" Transformer

$3.50

one half actual size

TRANSFORMER
A Lap Ahead of the Field

About the size of an English Walnut. Saves space; light weight; mounts anywhere; unsurpassed in performance. Ratios 1 to 3, 1 to 4, 1 to 5, $3.50. 1 to 10, $4.50. Ask your dealer to show you the Premier line of quality Radio Parts. Send for Free Bulletin 294 today.

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COLUMN STRAIN INSULATORS

18" long, made to withstand 200,000 volts when dry, and 100,000 volts when wet. Mechanical breaking strain 2,500 lbs.

4,960 purchased by us from the UNITED STATES NAVY. All are guaranteed brand new. Manufacturers list price $3.00. Our price $1.40 post-paid in UNITED STATES AND CANADA. If purchased in lots of ten or more, $1.30 each.

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We Repair All Standard Makes of Tubes, Including

W.D. 11 or 12
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All tubes guaranteed to do the work.

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The Heart of a Good Receiver

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...es a long way to be made into a radio crystal, and goes a long way to satisfy. Get it at your dealers.

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They are in original cartons and uniform size.

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Spark Transmitters, 75 watt, portable, made for U.S. Army Aeroplanes, Government cost $45.00
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We own and guarantee all merchandise offered.

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RIGHT NOW'S THE TIME TO PUT YOUR STATION ON THE MAP WITH A NEW AERIAL, DESIGNED ACCORDING TO QST. FOR MAXIMUM AND LASTING RESULTS (IT'S THE WIRE THAT STAYS NEW) QST TELLS US TO USE No. 12 SOLID COPPER ENAMELED AERIAL WIRE. 8ML HAD IT FIRST—ALWAYS HAS IT. 1c FOOT PREPAID TO 3rd ZONE. PLENTY OF IMITATIONS, BUT ONLY ONE GENUINE OHIO BRASS CO. PORCELAIN ANTENNA INSULATOR. 5" LENGTH 75c, 10" $1.50 (FOR THE HIPOWER FIENDS) PREPAID TO 3rd ZONE. FLUX DISTRIBUTING SHIELDS $1 ATTACHED. STATION DESIGN, NOT A SPLURGE OF POWER, IS THE ANSWER TO GLOBE-CIRCLING DX. FOR THAT TRANSFORMER OR CHOKE, SILICON STEEL PUNCHINGS 2½x10" 20c LB. CUT EM IN TWO FOR THE ENDS. No. 12 LOW LOSS DOUBLE COTTON COVERED TUNER WIRE $1.25 FOR 100 FEET, PREPAID. RADIO 8ML, 4837 ROCKWOOD ROAD, CLEVELAND, OHIO.

$12. EACH takes Ohio or Wagner synchronous 110 volt sixty cycle eighteen hundred R.P.M. motors built in ¼ H.P. frames. Can be used as power motors. Highest quality ¼" x 6" test tubes $3.00 gross. Perforated hard rubber separators 1¼c. No. 20 99% pure nickel wire $1.50 per hundred feet. Kimley Electric Company Inc., 2665 Main St., Buffalo, N. Y.

SOMETHING NEW. PYREX GLASS INSULATORS, 8BIN.

8DO's transmitter, sixty dollars, fifteen watts, complete. Best DX England, J. F. Atwood, Brighton Rd., Columbus, Ohio.

HARD-TO-FIND PARTS ARE "DUCK-SOUP" FOR US. SAYS ONE HAM, "BEEN TRYING FOR MONTHS TO FIND No. 12 DCC WIRE. RESULTS NIL TILL SAW UR ADD". MORAL, "BUY HAM APPARATUS FROM A HAM STORE." HERE A FEW ITEMS YOU'LL FIND VERY FEW OTHER PLACES. C.P. SHEET ALUMINUM SQ. FT., $.90; SHEET LEAD SQ. FT., $0.75; 1MFD 1750 VOLT FILTER CONDENSERS, $2.50; No. 12 COPPER ENAMELED SOLID PER FT., 1c No. 10 DCC MAGNET WIRE PER LB., $0.55; No. 12 DCC MAGNET WIRE PER LB., $0.60; No. 15 DCC MAGNET WIRE PER LB., $0.65; 5" OHIO BRASS INSULATORS, $0.75; 10" OHIO BRASS INSULATORS, $1.50; NEW IMPROVED AMRAD S TUBES, $10.00; BUZZERS HI-FREQ. ADJUSTABLE, $1.75; PLATE & GRID CONDENSERS 3000 VOLT, $2.50; ALLEN D. CARDWELL LO-LOSS 11 PLATE $4.25; ALLEN D. CARDWELL, LO-LOSS 23 PLATE $5.00; FIVE WATT RCA GRID LEAKS, $1.10; FIFTY WATT RCA GRID LEAKS, $1.65; INDUCTANCE CLIPS NICKELED, 7c; NAVY TYPE ½ KW KEY, $4.00; SEND RECEIVE SWITCH MURDOCK, $4.50; HAND MICROPHONESW. E. 284-W, $4.00; OSCILLATION TRANSFORMER RCA, $11.00; U.V. 202 FIVE WATT BOTTLES, $8.00; U.V. 203 FIFTY WATT BOTTLES, $30.00; ANTENNA SERIES CONDENSER, CARDWELL, $15.00, AND HUNDREDS OF OTHER ITEMS U'LL NEED SOME DAY. SO SEND UR QRA ON IN TO US AND LET US MAIL U OUR HAM PRICE LIST, U'LL LIKE IT, AS ITS THE ONLY ONE OF ITS KIND IN CAPTIVITY. SHIPMENT IS MADE THE SAME DAY THE ORDER IS RECEIVED, FROM THE ONLY HAM STORE IN THE FIFTH DISTRICT. FT. WORTH RADIO SUPPLY CO., 104 EAST 10th ST., FT. WORTH, TEXAS.

DX SEASON is nearing! Build your new antenna of No. 12 enameled solid copper wire, 100′ coils $.75, 1000′ $6.90; 20 inch Sure Fire porcelain insulators, $1.15, four or more $1.00 each; PR535 rheostat $1.20; PR539 rheostat $1.25; UP1368 Power transformers, $14.50; UP-1016 transformer $21.50; UP1653 filter reactor, 40 henry, 160 mills, FB for 50 watter, $7.25; UP1654 50 henry 300 mills, $10.45; UV1714 RF transformer, 200 to 5000 meters, use it in your Super-Het, $2.50; PX1638 chopper only $2.40; UC1806 .002 mfd. 6000 volt condenser, regular $7.00, only $1.80; UC488 1 mfd. 750 volt filter condenser $1.70; UC489 ½ mfd. 1750 volt $.95; UM530 2½ amp. HW meters $3.50; UM533 5 amp. HW meters $3.65. Drop us a card for the complete list, OM. It's the best you ever saw. E. F. Johnson, 9ALD, Waseca, Minn.

SELL—Acme 200 Watt Transformer, $12.00; U.T. 1643 Magnetic Modulator, $6.00. Wanted Spark Transmitter and Motor Generator. James Lazzatti, Finderne, N. J.

FOR SALE BY 5ER—One 250 watt Tube slightly used $50, or will trade for two new 50 watters.

INFORMATION—The first person sending me the name and address of the Firm, or individual, with whom Joe G. Bracker, (Probably New York) works, will receive a reward of $2.00. M. R. Alexander, Balboa Heights, Canal Zone.

S TUBE, $4.85; Remler 6 ohm rheostats, cost $1.75, sell $.95; 11 plate condenser, $1.35; Chelten Midget Vernier Condenser, cost $1.50, sell $.95; potentiometer, $.45. Radio 1BVR, 37 Broad St., Westfield, Mass.

DOES Your set tune sharply? Use UNIVERNIERS, $1.15, post paid. 8DDV, Rensselaer Falls, N. Y.

SELL OR TRADE—Western Electric 40 volt generator ½ H.P. 500 volt Peerless Motor. ½ KW Duck Spark Coil. J. P. Hyde, Bristow, Va.

FOR SALE—1 Emerson 500 volt 200 watt M. G. $50; 1-General Electric 1500 volt 500 watt dynamotor $40. Mark Moore, East Palestine, Ohio.

FOR SALE—Universal Wave Receiver, 84-26000 Wonderful DX Records $65.00; Western Electric 7A Power Amplifier with three 216A tubes, New $60.00; Two Western Electric 203B's same as VTone $7.00 each. Lead and Aluminum rectifier plates cut and drilled 99% pure. 9BSH, Cape Girardeau, Mo.

MANUSCRIPTS, Sales lists, circular letters, anything typed or mimeographed cheaply, Oliver Typewriter and case $12, automobile 6 volt Starting motor $10, Wavemeters calibrated, Real Ham Wavemeters 50—250 meters $12. 9AGL, 708 Eighth Street, Brookings, S. Dak.

NEW STUFF—JEWELL 0-500 MILLIAMPERES $6.00; 5 AMP TUNGAR TUBE $3.50; "S" TUBES PAIR $20.00; JEWELL 0-5 T-C-AMMETER, $9.50; UC-490 FILTER CONDENSERS, $2.25 ,USED: 200 WATT POWER-FILAMENT TRANSFORMER $12.00; 100 WATT POWER-FILAMENT $6.00. LET'S TRADE. WANT CHOKES, GREBE-13. CURTIS, 5AQC, 1109 EIGHTH AVENUE, FORT WORTH, TEXAS.

BARGAIN—20 watter neatly mounted $80.00; cost $130.00. 3 meters, RCA power, oscillation transformers and filter. Worked all districts in one night; 45 states worked. 9CHD.

SELL—Federal 1½ henry choke; Thordarson CW transformer: Amrad "S" tube. Archie Schultz, Clarkson, Nebr.

BARGAINS—BALDIES $7.75; Brandes $5.00; All-American Audio's, all ratios, $4.00 each; Radiotron receiving tubes, all types, $4.00 each; Super-Heterodyne transformers, 5000 to 25000 meters, $6.00 each; NR5 Neutrodynes $150.00 including phones, batteries and 5 UV201A's. Above prepaid. Amateur Radio Supply Co., 340 E. Tamarack St., Ironwood, Mich.

WILL SACRIFICE Grebe CR8 with RORK amplifier, three tubes, two 45 volt B batteries, $25.00 speaker, 100 ampere storage battery, 3000 ohm phones. All brand new. $140.00. J. Meltzner, 787 East 43rd St., Los Angeles, Calif.

FELLOW BUG HOUSE INMATES ATTENTION—We can supply you with everything you need for that C.W. Set At lowest prices. Any, or all the parts for that Edison Storage "B" Battery. Solid nickle wire, Genuine Edison Solution "N'everything. Number 12 Solid Copper Enameled Wire and long skinney porcelain insulators for that Ideal Antenna. Chemically pure sheet Aluminum and Lead for Rectifiers. Any size Bakelite Tube, Any size Radiotron Tube. Jewel Meter. Thordarson Transformer. Chokes, Grid leaks, or Rheostats. You can Bet on us for Real Service. Price list for the asking. Jackson's Radio Engineering Laboratories, 102 So. 6th St., Waco, Texas. WJAD.

SELL—1/6 horsepower 4 pole induction motor $8.00, 1 pair Federal 3200 ohm fones, $6.00; 1 RCA 375 watt power transformer list $25 sell for $15.00. Carlos Clouts, 2221 W. Park, Okla. City, Okla.

FOR SALE—400-600-1000 volt, 400 watt, double commutator Esco generator with field rheostat; ¾ h.p., 115 volt D.C. Westinghouse motor with starting box—both brand new—115 volt D.C., 72 volt, 60 cycle A.C., 250 watt Eck rotary converter with starting box, in excellent condition. Write for complete specifications and low prices. R. H. Barclay, 147 Milk St., Boston, Mass.

SELL—Omnigraph, you name price, good as new, Best offer takes it, RUSH! Fred Diehl, S. Water St., Kent, Ohio.

COMPLETE FILE OF QST. From Vol 1, No. 1 to January 1922 or later. Best offer takes them. Ross Gunn, Victor, N. Y.

SACRIFICE—Westinghouse R.C-A.R.R.T. with tubes, $150.00. Edward Cooper, Jr., Beamwell, West Va.

TRANSMITTER or parts wanted, in exchange for eight tube Super Heterodyne built to Experimenters' Information Service Specifications. A real D.X. Receiver that gives wonderful results. H. E. Brickner, 809 Bigelow St., Peoria, Illinois.

NAVY TRANSMITTING sets must sell cost $250.00, $22.00; Navy Tubes $2.75; Deforest 50 watters $11.50; cost $72.00; New Storage Batteries 6 volts cost $12.00, $4.00; Edison Elements .03-½ pair. 824 North 5th, Philadelphia, Pa.

250 WATT Acme C.W. transformer $13. New meters, transformer, etc. cheap. Write, 4DB, Cartersville, Ga.

FOR SALE—Grebe CR8 $55.00; Green two stage amplifier $20.00; W. E. Type 10D Loud speaker $35.00; Trinity loud speaker, $10.00; Grebe CR7, $90.00. J. Buttrick, Franklin, N. H.

THE BEST IN 'SUPER-HETS' MEANS GOOD DX. THE ENSALL RADIO LAB., SPECIALIZES IN BUILDING THE 'SUPER-HET'. ANY CIRCUIT DESCRIBED IN ISSUES OF QST. ALL R.F. TRANSFORMERS BUILT TO SPECIFICATIONS AND TESTED. ALL APPARATUS OF CORRECT DESIGN. GET THOSE AUSTRALIAN SIGS OFF THE ANTENNA WITH THE SUPER-HET. THE PRICE IS LOW. SOME AT $65.00, 8 TUBES OR 6 TUBES. WE ALSO BUILD TO ORDER ANY TYPE TRANSMITTER, RECEIVER OR WAVEMETER. THE AMATEUR LINE IS OUR LINE OF BUSINESS. INQUIRIES INVITED. ESTIMATES GLADLY GIVEN. THOS. ENSALL, 1208 GRANDVIEW AVE., WARREN, OHIO.

HERE'S A Couple of bargains. One Omnigraph in first class condition $9.00; 1 Westinghouse A.C. 1/6 horsepower, 110 v. 1700 rev. $15.00. Chas. L. Mohr, (Snyders Jewelry Store, Clearfield, Pa.

AMRAD LONG WAVE Tuner, 2500 to 25000 Meters. Like New, $17.00. Don Johnston, Euclid Beach Park, Cleveland, Ohio.

FOR SALE OR TRADE—¼ k.w. Packard transformer and New rotary gap. Make offer. All letters answered. R. E. Greenwood, Warren, O.

SAY—Have Plate and Filament Transformer, Brand New. New Hot Wire Ammeter. Resdon, one stage Radio Frequency, 2 stages Audio Frequency. A Hot Number. All Bargains. Write Melbourne Renken, Cole Camp, Missouri.

SELL ESCO—1000 Volt, 300 watt, 110-220 Volt motor-generator, filament winding used 3 months, guaranteed excellent condition, $150.00—Best bargain this issue. Also PARAGON RA10 and DA2 complete with batteries and tubes, Apco charger and Western Electric Victrola attachment, $140.00. Send 50% cash on either, balance C.O.D. L. C. French, Rdo 4SU, Box 1206, Wilmington, N. C.

COMPLETE—five watter with tube and transformers cost $40 sell $25. James Radford, West Monroe, La.

LOOK—Deforest reflex, $89.00; Acme condensers, $5.39; Magnavox R-3, $25.00; Homchargers, Tungars, $14.00; Acmeflex, $65.00; kit, $49.00. Audio Transformers: Federal, Amertrans, $4.89; Acme, Thordarson, $3.49. Headsets: Brandes, Federal, $4.89; Murdock, Frost, $3.49. Guaranteed. In original cartons. Include postage. Free catalogue. Fox Instrument Company, 1665 Third Avenue, New York.

WANTED—500 volt 100 watt dynamotor to run off 110 volt d. c. Must be in excellent condition and cheap. C. W. Clement, Java, S. D.

FIRST $45. gets largest R2 Magnavox, Guaranteed. Russell, 620 So. 16th St., St. Joseph, Mo.

SACRIFICES—600 v. C. W. transformer $6.00; ¼KW Amrad Quenched and resistance, $4.00; 4-point rotor, Benwood $1.50; 5-½ lb. spools, 24 enameled copper, $1.50; L. Sharp, Greenwood, Ind.

SELL—Slightly used ACE V ten dollars, New "Brandes Talker" eight dollars, Vibroplex eight dollars, write for quotations on standard apparatus. Holmberg Radio, Lignite, N. D.

OMNIGRAPH—Large size with 13 dials, $10.00. Bernard Taylor, Thornton, Texas.

OMNIGRAPH FOR SALE—Best condition fifteen dollars cash. Lawrence Pratt, Williams Arisona.

5 WATTERS repaired ,Tested, Guaranteed, $4.00. 3-CGD, Box 231, Denville, N. J.

TRANSMITTING Amateurs Attention—Don't have those costly tubes and meters lying around on table to be broken. Mount your transmitter on panel. Looks better, works better. QST says so. It's easy to cut those peep and meter holes with my panel tool. Cuts smooth hole one to five inches in diameter. Only $2.50 postpaid, C.O.D. Homer Malcomb, Whitewater, Wisc. 9EKH.

GREBE CR3 TUNER, NEW $45. 8BIN.

OLD SCHOOL HAMS—Long anchored at about 15 per have doubled speed in few hours. Their reports tell the story—free on request if mention your call. Method $2.50. Kills hesitation. Dodge Radio Shortkut, Dept. SC, Mamaroneck, N. Y.

REPAIRED TUBES which Won FAME from 3 BOV's at following Prices: UV 200, $2.25; 201, 201A, 199, WD12, etc., $2.50; 202, $3.50. Service and Satisfaction Guaranteed. S. Strobel, 3923 N. 6 St., Phila, Pa.

READ THIS TWICE—2 Clapp-Eastham HR receivers 175-825 meters $15.00 each. 1 Clapp-Eastham HZ two stage amplifier, $15.00; 2VT 2s $5.00 each, used very little. 1 Murdock antenna switch, $2.00. W. G. Mulks, Whitewater, Wisconsin.

EDGEWISE WOUND Copper ribbon the only really satisfactory antenna inductance 5/16 inch wide, 5 inch diameter 13 cents, 6 inch diameter 16 cents, 7-¼ inch diameter 18 cents per turn prepaid any number turns in one piece. Geo. Schulz, Calumet, Mich.

OHIO BRASS INSULATORS. 8" and 10". 8BIN.

Give "HAM PRINTERS" a chance to print u some real "HAM CARDS." Send us ur design and we "fix em up rite" 2 color wrk; $2.75 fr 200 crds and $1.00 fr each additional 100 crds. Mumaw & Buzzard, 701 Walnut Ave., Scottdale, Pa. 8BJT.

HAM TUNERS—Primary Secondary Tickler, Bakelite tube. Fit Honeycomb socket or mount behind panel 90 to 220 meters, $3.00. Sent parcel post collect. Send no money. Herbert B. Pearson, 98 21st Street, Brooklyn, N. Y.

SELL—OMNIGRAPH No. 2, 15 Dials, like new $15.00. H. C. Hicks, 2380 Grand Ave., New York.

1914 INDIAN Twin Motorcycle for any radio. New tires, rings and bearings. Box N, c/o QST.

HAMS ATTENTION—U. V. 202, $5; U. V. 216, $3. Other bargains. Write for list. Everything guaranteed. Edwin Moutoux, 1111 Louisiana St., Evansville, Ind.

FILAMENT transformer for 5 watter $2.00; RC 50 watt socket $1.50; Federal hand microphone $4.00; Murdock .001 variable condenser $2.50; 2CEL.

FARADON CONDENSERS—UC 1820 brand new list, $7.50, sell for $3.50; type CB Load coil Westinghouse make lists, $6.00, sell for $1.50; postage prepaid. Geo. Schulz, Calumet, Mich.

YES, SIREE—We've got 'em. Latest type low-loss tuner coils, with 5 interchangable secondaries. 12 to 220 meters. With circuit blueprint. Kind now used at 1MO. Per Set,$4.00. C.O.D. Ames Radio Shop, Francesville, Indiana.

KEY AND BUZZER FAILURES have thanked us for License easily obtained. Their reports tell the story, rapid progress quick success—free on request. Method $2.50, Kills hesitation. Dodge Radio Shorthut, Dept. SC, Mamaroneck, N. Y.

BAKELITE STRIPS—for sub panels and antenna insulation to 5" wide any length 3/16 inches thick 100 square inches and over 1 cent square inch, postage 2 lbs. per 100 sq. inches. Cash with order. Give length and width when ordering. Geo. Schulz, Calumet, Mich.

FOR SALE at a bargain—One new R.C.A. power transformer model UP 1016. E. F. Pritchard, Box 111, High Point, N. C.

LCLOSS TUNERS and COILS. 8BIN.

WANTED—Westinghouse RC set, one pair of push-pull transformers. Will trade standard transmitting apparatus. Morris Decker, Baldwinsville, N. Y.

WHEN BETTER cards are printed, 8BJT will print them.

FOR SALE—Grebe "13" in original carton, $50; U.P. 1016 in original case, $20. Wanted General Radio Type 174-B Wavemeter. 2CVS.

MAGNET WIRE all kinds and sizes No. 10 DCC 50c lb. add 2c per lb. for each size up to No. 20; 100 ft. Enameled aerial wire 85c; Best grade Silicon Transformer Steel cut to size 22c lb; Special japaned radio frequency Transformer Steel cut to size 45c lb. Cash with order, Morton Electric Co., 4832 Rice St., Chicago, Ill.

FOR SALE—EDISON BATTERIES. ELEMENTS IN GOOD CONDITION. A6 CELLS $2.50. A10 CELLS $4. EACH CELL WEIGHS ABOUT 25 LBS. ADD FREIGHT, EXPRESS OR POSTAGE CHARGES. TEAR CELLS DOWN YOURSELF AND SAVE CASH. I PAY POSTAGE ON ELEMENTS AT 4c A PAIR. BERNARD STOTT, 60 PALLISTER AVE., DETROIT, MICH.

LIGHTNING PHOTOS—real zippy pictures of OM Static at his worst. Two different, 4x5, 35c. 2BWV, 9566-113th Street, Richmond Hill, New York.

SPECIAL SALE—New and used equipment. Grebe RORK first class condition $40.00; Western Electric Type CW-1055 combined 10 watt transmitter and receiver with dynamotor but without tubes, a fine buy at $75.00; Radiola VI excellent condition $100.00; Radiola AR-1300 tuner is the berries at $35.00; Magnavox R-3, a good one for $22.00; a fine stock of new transmitting and receiving equipment at 10 percent discount to Hams. Everything guaranteed. Prompt shipments. If we don't have it we will get it for you. quick. Shipments C.O.D. J. F. Davidson, 6CEK, Kingman, Arizona.

WHAT OTHERS HAVE accomplished—what you may expect to gain—told by qualifying records 150 students now Licensed. Many are ORS A.R.R.L. Some Commercial Ops. Failures by all other methods have succeeded. Old School Hams increased speed; doubled after memorizing Code our way. Qualifying records and detail reports on request. Method $2.50. Kills hesitation. Dodge Radio Shortkut, Dept. SC, Mamaroneck, N. Y.

TRADE OR SELL CHEAP—Two victrolas, National Cash Register, Motorgenerator, 600 volt dynamotors; 75 watt transformers, two 30 henry chokes—want supplies for 100 watt set. 9-DLY, Brillion, Wisc.

GENUINE SILICON Transformer steel cut to order 25 cents lb. 10 lbs. and over, 4 cubic inches, weight 1 lb. postage extra. Geo. Schulz, Calumet, Mich.

EDISON ELEMENTS—Type A, first class, wired with No. 18 solid nickle wire, spot welded joints, (twisted joints cause trouble) .07½ cents per pair prepaid. Send 15 cents stamps for four element transmitter cell and special prices on quantities. Type A-6-225 ampere hour, and A-8-300 ampere hour Edison cells in good condition. Cut down your guy wire losses; 17" oak insulators, 1" square, boiled in paraffin, 25 cents each prepaid, less in quantities. Arthur Chapelle, 7NX, Woodburn, Ore.

SELL—Radiola III, complete with two W.D. II tubes and Brandes Phones. Cost $35, will sell for $30. Never used. C. C. McDowell, Parnassus, Pa. R.F.D. No. 2.

CHEMICAL RECTIFIERS AND SUPPLIES. 8BIN.

ATTENTION HAMS—UV 202 $5, UV216 $3 each. 2 will operate 2-5 Watt tubes. Tubes Guaranteed, Dealers wanted. The Arlington Radio Laboratory, 214 Beach St., Arlington, N. J.

WANT WAVEMETER—accurate resistance units, or current supply. Have Grebe RORD, Kellogg condensers, honeycomb coils, cabinets and miscellaneous parts. If you think we can do business write G. V. Bradbury, 441 Sheidley Bldg., Kansas City, Mo.

WANTED—Grebe CR8, Hugh Thomas, 55 Hanson Pl., Brooklyn, N. Y.

COMPLETE STORY—as to merit cannot be told—is still in the making. Students constantly report more astonishing results from limited study. As told to date free on request. Method $2.50; kills hesitation; Dodge Radio Shortkut, Dept. SC, Mamaroneck, N. Y.

PYREX your antenna system. Pyrex Lead-in Insulators, $3.75. Pyrex Strain Insulators $1.60. Unit of four Pyrex Strain and two Pyrex Lead-in Insulators for $12.50. Prepaid in U.S. P. F. Bechberger, 8BFH, Norwalk, Ohio.

SUPERHETERODYNE FILTER—Eliminates noises and distortion. An essential finishing touch. Consists of choke coil, non-inductive resistors and diagram, $6.25. Radio Central, Dept. O, Abilene, Kansas.

FOR SALE—Esco 1500 watt 2000 volt motor generator unit 3 HP 110-220 volt AC motor, Weston 301, 0-3000 volts with Reactors and 0-1000 milliampere meters incuded $325. Also 0-100 milliampere Weston-One 204 with mountings. Two Choppers. C. R. Runyon, Jr., 544 North Broadway, Yonkers, N. Y.

DEALER'S surplus stock of Radio Corporation transmitting parts. Some as low as two thirds off. Write for list. Hurry. D. W. Pinkerton, Station B, Toledo, O.

REMLER, GIBLIN and DeForest coils, new mounted only few left as follows —100-150-200-300-400-500-1000 turns half list price. Postage extra. Geo Schulz, Calumet, Mich.

DON'T OVERLOOK THIS. Storage "B" batteries built with Edison Elements are rechargeable and will last a lifetime. Look these prices over and order yours now. Every battery assembled and wired. Potash included. 24 volt 1¼ ampere type A $2.75. 50 volt type A, $5.50; 100 volt type A, $10.50; 100 volt 4 plate 2 ampere type G, $14.00; 150 volt 2 ampere type G, $18.00; Type A Elements (drilled) 5c per pair; Type G (drilled) 3c per pair; ¾x6" container 3c; 1x6" container 4c; No. 20 pure nickel wire 1c per ft.; Perforated separator ½c each; 78 cell Rack $1.95. J. Zied, 530 Callowhill St., Phila, Pa.

HAMS—Get our samples and prices on Printed Call Cards in ONE, TWO and THREE Colors. Also Radiograms, Letterheads and Envelopes. Hinds & Edgarton, 19 S. Wells St., Chicago, Ill.

UV-199 Users, here's your chance. 3 cell Edison Batteries, 3.6 volts, 20 ampere hour. Army war material, have never been put in service. Shipped dry. With original instructions and dry electrolyte $7.50. Without electrolyte $7.00. Raymond Roof, 198 Freemont St., Battle Creek, Michigan.

ARE YOU PLANNING to manufacture Radio Parts? Here is a chance to save a lot of money. We offer slightly used tool equipment for 19 standard parts. Write for particulars, Box W, c/o QST.

LOW LOSS CONDENSERS. ALL MAKES. 8BIN.

FOR SALE—Model X Crosley Receiver. Perfect Condition, $30.00; Zenith 4R New, Slightly scratched, $75.00; Power Speaker, No Horn, $12.00; Riggs Rectifier, Good Shape, $5.00; New Farm-Electric Ford parts Plant Light Plant, 32 volt 1500 watt, still in original crate, $295.00, no batteries; One new "Cleartone" Guaranteed, $45.00. All inquiries answered. Wisner Electric and Radio Shop, Wisner, Nebr.

FOR SALE OR TRADE—Stahl Sink. Used very little. Rennaker, 9MM.

READ THIS—sell, brand new two stage Magnavox Power amplifier. First $40.00 takes it. A real bargain. Clair Lewis, Washburn, Me., 1AGO.

COUPLED INDUCTANCES—BRING YOUR TRANSMITTER UP TO DATE. INSTALL ONE OF OUR INDUCTANCES MOUNTED ON ¼" BAKELITE STRIPS. WOUND WITH ⅛" BRASS RIBBON HIGHLY NICKELED. SPACED ¼". TYPE A. 2 COIL $15.00; TYPE B 3 COIL $20.00; HINGED OR SLIDING—STATE NUMBER OF TURNS DESIRED. 8NX, CAPITOL RADIO, 8JJ, 131 ISLAND, LANSING, MICHIGAN, "INDUCTANCES A SPECIALTY".

ESCO 5 to 500 volt dynamotor $30.00; Paragon 2-5-U transmitter $35.00; J. Hayden, 117 Wendell Ave., Schenectady, N. Y.

CHEMICALLY PURE aluminum 1/16" thick, 80 cents; ⅛ inch thick $1.60 sq. ft., postage ½; 2 lb., ⅓, 3 lbs., extra. Geo. Schulz, Calumet, Mich.

No. 14 D.C.C. WIRE, 8BIN.

LOW LOSS—Special prices on coils, Schnell and Briggs types $2.00; Condensers, 250 mmfd. and 500 mmfd. General Radio $2.70 and $2.86 for plain, $4.20 and $4.35 for geared, Cardwell $3.55 and $4.05. UV 201A's, $4.50; UV 202, $7.20; UV 203, $26.50. Discounts on following: Burgess batteries 20%, Brandes 15%, Baldwin 12%, Frost 15%, Radio Corporation and Grebe sets 18%. Total amount must be remitted with order. Frosell Radio Laboratory, South Williamsport, Penna.

CANADIAN 3GG. selling out. 20 C.W. & Fone with DX on C.W. to England. 1300 Miles on Fone. Complete with tubes $150, 600 Volt Edison Battery complete, $100.00; Two 120-6 Volt Storage Batteries, $15.00; Wavemeter, General Radio 174 B, $40.00; One 6 volt-40 Amp. Hr. Storage Battery, $9.00; ¼ K.W. Quenched Gap $7.00; 2" Spark Coil, $6.00. Large assortment of tubes, phones, keys, switches, meters all to be sacrificed. Say what you want. 3 G.G. Canada.

ESCO M-G 500 volt 200. watt practically new cost $90.00, Sell $60.00. Half cash balance C.O.D. 8DIL.

FOR SALE—Radiola V with 3000 ohm Frost Phone like new cost $120.00; sell for $55.00; $5.00 deposit with express Co., balance C.O.D. Subject examination. Geo. Schulz, Calumet, Mich.

HI.—Cannot use my 60 Cycle, 500 Volt, 150 Watt, practically new, $75.00 Motor Generator on 50 Cycle supply here. Sell for $40.00. First money order gets it. Write T. S. Depew, 531 Santa Monica Blvd., Santa Monica, Calif.

SALE—20 watt CW transmitter complete with tubes, etc. $50.00—9CMV.

MOTOR-GENERATORS 800 volts 200 watts with 110 volt A.C. motordrive, $55.00. Also 500 volts 150 watts $25.00. Motors and Generators repaired, rewound, 1 year's guarantee. Morton Electric Co., 4832 Rice St., Chicago, Ill.

SELL PARAGON R A 10 $35.00. Long wave tuner. Best offer takes it. Glass battery jars 9-51/8-12 high. Description and list of radio receiving parts free. All letters answered. J. D. Schroeder, Wisner, Nebr.

EVERYTHING FOR THE HAM. 8BIN, E. J. NICHOLSON, 1407 FIRST NORTH ST., SYRACUSE, N. Y.

SUPERHETERODYNE—Built according to Experimenters information service plans. Expert wiring. General radio and best parts used throughout. Eight tube model. First $275.00 takes it. Seymour Mayer, Beechmont, New Rochelle, N. Y.

No. 12 ENAMELED WIRE 1c FT. 8BIN.

HV DC can supply machines to deliver plate current to any set from 5 to 100 watts. If you are interested in plate supply don't pass this up. A card will bring the dope. W. G. Mulks, Whitewater, Wisconsin.

"HI FELLOWS"—Hv hr OM's 3ABG's 5 and 10 watter that accomplished much Continental DX as many u HAMS hv same logged to B Sold at $25 and $40 Respectively. Best Grade App. used, all New with Tubes, Panels Lettered. A few Genuine Audiotrons left and sum gd Receiving Equipment. S. Strobel, 3923 N. 6 St., Phila, Pa.

RADIO GENERATORS—500 volt 100 watt $28.50 Battery Charging Generators $8.50, High Speed Motors Motor Generator Sets, all sizes. Motor Specialties Co., Crafton, Penna.

MAKE $120 WEEKLY IN SPARE TIME. Sell what the public wants—long distance radio receiving sets. Two sales weekly pays $120 profit. No big investment, no canvassing. Sharpe of Colorado made $955 in one month. Representatives wanted at once. This plan is sweeping the country—write today before your county is gone. OZARKA, 853 Washington Blvd., Chicago.

IS YOUR NEUT RIGHT?—To revitalize unneutralizable Neutrodynes, we devised this Kladag Coast to Coast Circuit. Uses same panel, etc. as Neut, except three less parts. Merely rewire. Success certain. Necessary stabilizer, 22 feet gold sheathed wire, circuit and complete, simple instructions, $5.00 prepaid. Many have already rebuilt their Neuts-and written wonderful testimonials. Thousands will do it. Be FIRST-have the finest five tube set in your neighborhood, revitalize others' Neuts. Description, etc., 10c. Radio Lists, 2c. Stamps accepted. Kladag Laboratories, Kent, Ohio.

TELEGRAPHY—Morse and Wireless—taught at home in half usual time and at trifling cost. Omnigraph Automatic Transmitter will send, on Sounder or Buzzer, unlimited messages, any speed, just as expert operator would. Adopted by U. S. Govt. and used by leading Universities, Colleges, Technical and Telegraph Schools throughout U.S. Catalog free. Omnigraph Mfg. Co., 16M Hudson St., New York.

GREBE CR 13 in excellent condition forty-five dollars. I. Vermilya, Mattapoisett, Mass. 1ZE.

FOR SALE—2000 Volt 1500 Watt 1750 R.P.M. double Commutator Motor Generator Set, Motor end A.C. 60 cycle $200.00. Also, 2000 Volt 1000 Watt 1750 R.P.M. Motor Generator, Motor 110 Volt Direct Current $125.00. Queen City Electric Company, 1734 West Grand Avenue, Chicago, Illinois.

GERMAN RECEIVING TUBES $2.40, with socket and ballast tube; filament 4/10ths ampere, 5 volts: plate 40-60 volts. Excellent detector, good amplifier,

fine for experimenting, add postage. Arthur Beyer, 106 Morningside Drive, New York City.

TRANSMITTING TUBES— All sizes, also Kenotron rectifiers, and Kenotron plate and filament transformers, 500 cycle Generators and Transformers all sizes. General Electric 1500 volt, 500 watt double commutator Generators with 2½" Shaft extending, new machines $45. Also other apparatus. J. K. Hewitt & Co., 252 Neptune Avenue, Brooklyn, N. Y., Radio 2RK-2FP.

NAVY CN113 A—300-2500 M Tuner $21.50; No ham station should be without one. One of these compact, efficient, long wave receivers will complete that commercial appearance to your station that you are after. It oscillates over its full wave range by means of tickler coil. Binding posts are provided for audio attachment. Tunes DX broadcast, ships and arcs. Crystal detector mounted on panel. Simple switch gives choice of audio or crystal. Size. Photo page 78 August QST. Brand new GE 0-150 milliameters. Panel type, in original boxes $2.75; Navy special (CN998) 50-600 meter receiving. For crystal or audion cost $500, price $50.00; Navy CF 753 1000 to 10,000 meters cost $800, price $50.00; 350 volt dynamotor $17.00; 500 cycle hand generator, can be belt driven $22.50; 53 ft. section pole $20.00; these prices include shipping charges. Geo. Eaton, 1915 South 12th, Philadelphia.

FOR SALE—Advance synchronous rectifier new, $25. Power transformer UP-1016, $25.00. Magnetic Modulator UT-1367, $10.00. Two new S tubes, each $7.00. Complete parts for 100 watt cw set, inquire for prices. Harold Schearer, 733 Madison Ave., Reading, Penna.

SELL—Complete 250 watt C.W. and phone set, all or in part. ESCO Item 41 2000 volt 3 unit motor-generator with field rheostats, motor 110-220 volt 60 cycles. $275.00. 250 watt transmitter completely mounted with tube and transformers $250.00. Grebe CR8—new type—$50.00. All in perfect condition. 8AMM-8XAN, Webster, N. Y.

20 WATT CW AND FONE $48, 2 Stage amplifier $12. 9ELT, Whitewater, Kansas.

TRADE—500 Volt 200 watt Emerson motor-generator for 100 watt stuff or 50 watters, 9DRO.

50 TO 75% DISCOUNT on all RCA Transmitting Apparatus. F'instance: 750 watt Power transformer, $18.50, list $38.50; Antenna Ammeters, $2.50, list $6.00; 0-1500 Voltmeters, $11.00, list $42.50. Order quickly as everything is going fast. Everything new and guaranteed. Get my complete list. 2AEN, William Golden, 680 West End Ave., New York.

GOOD TYPE A Edison elements, all you want, Any time, five cents pair, Postpaid. M. Harris, YMCA, Riverside, Calif.

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MOTOR GENERATOR BARGAINS—G. E. Motor 220 Volt 60 Cycles 3 Phase 1750 R.P.M. Generator 400 Volts 150 Watts Ring Oiled $35.00. Esco Motor 220 Volt Direct Current Generator 500 Volt 200 Watts, $35.00. Esco Motor 220 Volt 60 Cycles single Phase A. C. Generator 500 Volt 200 Watts $50.00. 750 Volt 200 Watt 3400 R.P.M. Generator Ring Oiled, only $30.00. Also, others. Queen City Electric Company, 1734 West Grand Avenue, Chicago, Illinois.

TELEFUNKEN 30 WATT POWER TUBES type RS5C II, filament 2 amperes, 9 volts: plate .05 amperes, 1000 volts; Price $16.00. 50% discount on the following Radio Corporation apparatus: chopper wheel, all types of condensers, filter reactors, magnetic modulators, rheostats transformers, meters (hot wire 0-2½, 0-5, thermocouple 0-2½, 0-5, $10. milliampere 0-250, 0-500, $10. 0-1500 volt $15.00). All new and in original carton, genuine R.C.A. apparatus, unconditionally guaranteed. Sent C.O.D. or money order prepaid. Inquiries invited. Arthur Beyer, 106 Morningside Drive, New York City.

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$20 takes NEW 1KW PACKARD unmounted transformer. 9DTJ.

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GET THOSE CARDS FROM 9AQB. Red call and border, with blue lettering. 200-$2.00, 500-$3.50. Write for sample card. Also station letterheads, envelopes and message blanks. Ask for prices. Bill Lippman, Jr., Cabany Post Office, St. Louis, Missouri.

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VACUUM TUBES—Guaranteed genuine, all types, $3.75 postpaid. Nashua Sales Service, Dept. Q1, Nashua, N. H.

PURE DC FOR THE PLATES—GE 12/350 volt .143 ampere dynamotors with filters $18. Holtzer-Cabot 12/500 volt .07 ampere $22. GE 24/1500 volt .233 ampere 6000 RPM double high voltage 56 segment commutator. 750 volt tap, $45. Adapted for belt drive $48. When driven will also generate current for filaments etc. Navy Flame Proof Keys with Blinker Light, $1.50; Crocker-Wheeler 500 cycle self excited and motor generators. Henry Kienzle, 501 East 84 Street, New York.

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G2CC—H. E. Nicholls, "The Whins," Stocksfield-upon-Tyne, England.

2DV—Frederic R. Colie, Woodcrest Avenue, Millburn, N. J.

G2JF—C. G. Williams, "Moranedd", 86 Rullerton Road, Wallasey, Cheshire, England.

2AAN—Stanley E. Hart, 19 Marshall Road, Yonkers, N. Y.

2CV—Reissued to Irving Korenmann, 1465—60th St., Brooklyn, N. Y.

4DB—L. B. Womelsdorf, Jr., 103 Howard Heights, Cartersville, Ga.

4IU—4XE—Wm. Justice Lee, Winter Park, Fla.

6BBV—Jack Barsby, 518 W. 50 St., Los Angeles, Cal.

6CTX—Julius Geritz, 160 S. 40th St., Richmond, Calif.

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8CNH—Marx Cristman, 232 Prospect St., Herkimer, N. Y.

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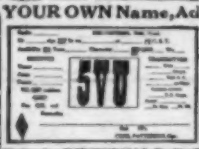

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6BBV—Jack Barsby, 518 W. 50 St., Los Angeles, Cal.

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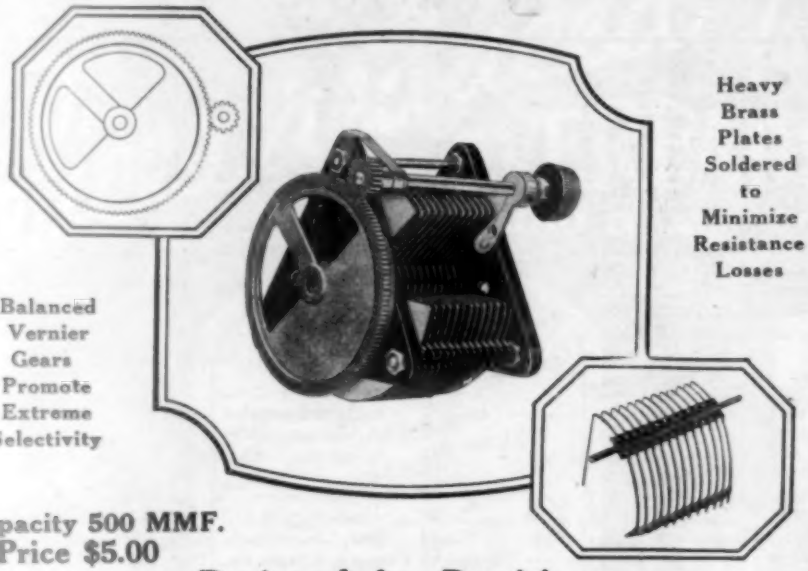

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Balanced Vernier Gears Promote Extreme Selectivity

Capacity 500 MMF.
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PRECISION in a variable condenser gives you the *sharp tuning* and *low losses* which mean *greater selectivity, signal strength and range.*

Balanced ratio gears with accurately machined teeth provide a *perfect vernier adjustment.*

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Write for our New Instructive Folder
"Quality Condensers"

The Traffic Department

F. H. Schnell, Traffic Manager
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Having just returned from the "shack" of 1XW-1MO, where we kept a one-way schedule on 80 meters with the U.S.S. Utah for Ensign Harry Dobbs, our director and 4ZA, we can hardly restrain our enthusiasm for short waves and the fine opportunities that await us hams. If you haven't tuned your transmitter or receiver down to the band between 75 and 80 meters, you are missing something you never realized and you have a grand and glorious surprise waiting for you—get down as soon as you can and don't worry about your antenna current as long as you can get a reading on your wave meter and know your set is oscillating on the wave you are using.

We worked 1BLX on August 4th. He was getting something less than .1 ampere, his signal was terrible. 3CA overheard our conversation and said that sigs from 1BLX sounded like 100 K.W. Since then, 1BLX has managed to squeeze it up to .4 ampere and his sigs are easily audible over a hundred feet from the fones on one step of audio without antenna or ground connection.

Not over two hours ago(August 8 10:19 A.M., E.S.T.) we worked 3ADP (one 5 watter) who had a good signal. He reported this as his best daylight work, but 20 minutes later he was working 1SF, an additional 100 miles, in broad daylight in midsummer.

Last night Joe Furrey was over at one of the BCLs not far from 1XW and where no reception was possible while 1XW used a conductively coupled transmitter on 112 meters. Joe called us and asked us to transmit. We pounded away for over an hour when Joe finally called up again to ask when we would start. He could not hear 1XW on a well-known make of BCL set at a distance of about four blocks in spite of our jamming everything we had into the set, which was about 750 watts with 2.3 amperes in the antenna, coupled Hartley.

Gang, don't lose any time in getting down to some short wave band. In a few nights we heard the following stations on waves between 75 and 80 meters—all with sigs that really are QSA: 1BZP, 1SF, 1ZE, 1AAC, 1BLX, 1BIE, 1MY, 1CQK, 1AKI, 1AHW, 1XAP, 1CCX, 1GB, 2MU, 2MO, 2KK, 2AQR, 3MB, 3BG, 3ADP, 3APV, 8CYI. POZ is on about 77 meters and UFT on 95 working to LPZ. You can hear these stations most every night, yes—right during quiet hours, too! Doesn't that make you itch to get back on the air again? Mr. Maxim, 1AW just left here with the fever of short waves. He asks us to drop over as soon as we can to lend a hand in getting 1AW down to 80 meters so he can operate again without having to sit up all night to do it. MIM! Oh, its great stuff.

Two things of importance happened at the Annual Board Meeting of July 25-26. The name of the East Gulf Division has been changed to the Southeastern Division, as requested. A new division to be known as the Hudson Division, taking into its territorial rights all amateurs located in the counties of New York, Bronx, Richmond, Kings, Queens, Nausau, Suffolk, Westchester, Rockland, Putnam, Orange, Ulster, Dutchess, Columbia, Greene, Albany, Rensselaer, and Schenectady of the state of New York, and the counties of Bergen, Passaic, Essex, Union, Middlesex, Monmouth, Hudson and Ocean of the state of New Jersey. E. M. Glaser, 2BRB, is the new manager of the Hudson Division, former ADM of Eastern New York. Alright, Hudson Division, we look for big things from you!

Work with VDM for the past month has been rather slim. The stations having worked VDM are: Canadians 1DD, 1AR, 1EF, and 9AL. 1XW and 5XAW worked VDM. Others reporting hearing VDM are Canadians 3WV, and 5GO, U.S. 3CA, 3BHV, 4HZ, 5AJB, 8DAE, and 9ZG.

We have word from Mr. Marcuse, British 2NM, that the British hams will be going full blast with plenty of power on waves between 115 and 130 meters on October 1. More power to them! We are ready.

The latest schedule of 1DO and 1HT tell us that 1HT calls 1DO at 4:00 and 6:00 P.M.? C.S.T., and 1DO calls 1HT at 5:00 and 7:00 P.M., C.S.T. each day until October. 1DO uses 106 meters and 1HT uses 120 meters. 1MT, on 110 meters, also will test with 1DO and 1HT. Reports of this reception should be sent to A.R.R.L. Head-

quarters for forwarding to the proper authorities.

The reports speak for themselves and as our space is limited, we close with the advice to get down on short waves and enjoy those days which we thought were gone forever!

ATLANTIC DIVISION
C. H. Stewart, Mgr.

EASTERN NEW YORK—There is more activity than would be expected in this weather. Many reports haven't dropped a bit while a few have slumped badly. 2WZ has been on every day and night since school closed. 2BO hasn't been heard from in a long time. 2BRB has undergone some changes and now there are three transmitters permanently installed: 50 watt pure C.W. only, 8 watt C.W., I.C.W. and 250 watt spark (which is used with great caution.) Hi. 2CLA has a new 50 footer in the back yard which eliminates the house as an antenna support. The Radio Club of Brooklyn is continuing its activities throughout the summer.

Manhattan—Many active fellows are away. No report was received from 2CMG which is discouraging. 2CHK, the C.M., has been going strong.

Bronx—2CWR is closed for the summer having been appointed a Lieutenant in the Life Saving Service, Signal Division. 2CWP has promised to send in regular reports.

Staten Island—Mighty little doing. 2CEV will be on with C.W. soon.

Queens—Only one station reported—2APM. (FB, OM, you saved the Borough that time). 2BCK has been inactive but will be back soon. 2AVE has been off for several weeks but will be back in September. 2BNC isn't doing anything until fall.

Dist. No. 1: 2AV has opened up on Fire Island with a spark that is so broad it must be direct-coupled to the antenna. (Watch your license, OM!) 2ABD isn't on because he can't get enough help to raise his antenna.

Dist. No. 2: For a change, we have a report, thanks to 2BQB, who is cooperating nicely. 2UA is doing his best to get more reports. 2BQB is handling all the traffic in this section of the country.

Dist. No. 3: 2CPZ is off for a while.

Dist. No. 4: All stations in Rockland, Sullivan, Ulster, Orange, and Green counties, with no exceptions, are asked to send in reports to C. K. Taber, 2AGO, Milton, N. Y., who has been appointed the new D.S., succeeding 8CKN. 2CNP and 2CNI have resigned as C.M's. 2CXG is off the air temporarily.

Dist. No. 5: 8BXP reports no traffic due to rebuilding. 8AVJ ditto. 2CGH is keeping right at it, never failing to report on time. 2GK is patiently waiting for cooler weather before starting real work again. 2ADD is a great C.M. He got every member of the Yonkers Radio Club to sign a pledge that they would QSR or deliver all messages received within 48 hours. They also promised to keep records so that 2ADD can inspect them at any time. (FB, gang. Great Stuff). Let's have more of that kind of business. The Secretary of the club just received his call, 2AAN. He will be on the air soon boosting traffic.

Schenectady—2ACS, C.M., is away but active nevertheless seeing that reports get in. 2BY has come back and is on quite a bit. 2CWJ is on all the time. He has been reported by 6AHP, his first coast station. (FB, OM.) 2CPA has sold out complete. 2CGJ has just completed a 90 foot tower which makes his place look like a commercial station. 2ADM is on again after telling us he was gone for good.

Traffic: Brooklyn: 2WZ, 121; 2BRB, 103; 2CPQ, 86; 2ADC, 72; 2CHY, 60; 2ABR, 26; 2AHI, 23; 2CJR, 29; 2ABN, 8; 2AX, 12; Bronx: 2CRQ, 69; 2CWP, 48; 2AAI, 18; Manhattan: 2KR, 99; 2CHK, 21; 2CIZ, 30; 2CSL, 14; 2CZR, 12; 2EV, 22; 2BNL, 8; Staten Island: 2CEP, 11; 2CEV, 28; Queens: 2APM, 12; Dist. No. 1: 2CXB, 15; 2CNM, 8; 2BPB, 7; Dist. No. 2: 2BQB, 40; Dist. No. 3: 2ANM, 29; 2CDH, 60; Dist. No. 4: 2AQR, 54; Dist. No. 5: 2CGH, 104; 2CTH, 16; Yonkers: 2ADD, 19; 2APY, 17; 2BGD, 14; 2CIL, 8; 2AQH, 14; Schenectady: 2BY, 30; 2ACS, 28; 2CGJ, 8; 2CWJ, 84; 2BSK, 79; 2AM, 16.

WESTERN NEW YORK—The July report has been a wonder in this district with many stations reporting. The fall season will be a hummer with new stations of higher power and of the largest type allowable, some wonderful records are sure to land in the Atlantic division before the year is over. The work of 8DAA has come to attention on broadcasting of A.R.R.L. news and it has not only been heard here at times, but elsewhere. (FB) 8NB, of Rochester, deserves credit for his activities in getting his city on the map. D.S. R.H. Nichols of Webster, N. Y. has this dist. and I guess he's quite proud of it. Syracuse is without a D.S. at present but it won't be long as there are several ops.

Traffic: 8ACM, 329; 8ABX, 11; 8ADM, 22; 8ARG, 7; 8AFQ, 8; 8AMM, 24; 8AXN, 9; 8ATR, 26; 8AVD, 10; 8AY, 20; 8BVD, 49; 8BZA, 8; 8BOE, 84; 8BQN, 18; 8BHM, 22; 8BSF, 123; 8CYI, 136; 8DAA, 55; 8DGA, 62; 8HJ, 25; 8NB, 72; 8PJ, 53; 8PK, 31; 8QB, 15; 8SR, 28; 8VW, 5.

DISTRICT OF COLUMBIA—The first of July saw the automatic replacement of the old by the new system of message handling and the same well known stations are still on the job. No new material having the ear-marks of an O.R.S. has advanced conspiciously in the district. There has been the usual activity slump at some of the stations as summer has taken a firm hold. 3BWT continues to blaze forth with a maze of operators. 3AB is being resurected and apparently will be operating within two months. 3JJ is to be heard from as is 3SU.

Traffic: 3BWT, 82; 3BSB, 15; 3HS, 15.

MARYLAND—Very little to report for Maryland due to the meagre data turned in to the A.D.M. 3APV is keeping 'em moving at Chevy Chase in spite of QRN. The bulk of the Baltimore traffic is being handled by 3APT, 3LG, 3SF, 3FB, 3BU and 3PH. 3TF with a coupled Hartley has been reported in New Zealand. 3SF is doing excellent short wave work on both 5 and 50 watts. 3LL is doing the usuual good work in spite of the hot WX, and says his report may be small, but his msgs are real and not rubber stamp. (FB) He also reports hearing VDM with fine audibility.

Traffic: 3SF, 24; 3LL, 8; 3APT-3ZD, 75; 3APV, 86; 3BU, 12.

EASTERN PENNSYLVANIA—Reports are rather slim this month, only a few old timers came across. 3AKR will soon be QRA California as 6BUK. The Allentown gang is sticking on the job despite the hot weather and quite a few msgs were handled. 3AUV secured excellent results with the Master Oscillator system, improved his note and also DX. 3DT has taken unto himself an O.W, but how about those traffic reports, OM? 8EU and 8BFE are the first reporters from Williamsport in months, let's have more from that section. Please note new QRA for D.S. dist. No. 6. H. M. Walleze, 356 Lightstreet Rd. ,Bloomsburg, Penna. No individual activity from Philadelphia. 3BTU, 3HD and 3FS are the only stations reporting.

Traffic: 3ZM, 10; 3BNU, 21; 3EK, 22; 3CJN, 28; 3MQ, 4; 3TP, 41; 3UE, 6;3ZO, 118; 3QT, 105; 3AUV, 65; 3AQG, 16; 8EU, 31; 8BFE, 91; 3BTU, 5; 3HD, 17; 3FS, 14.

NORTHERN NEW JERSEY—2AJF has again failed on a report and if this occurs again a new D.S. will be recommended. 2CQZ had the largest total of msgs handled for the state. 2WR will be off the air for repairs and will return with increased power. 2AXF has coupled his transmitter and steps out FB again. 2CPD is on every night and can clear traffic easily into Atlantic City and Philadelphia. 2AUH continues to work everything but sixes and sevens with his lonely 5 watter. 2BUY can't leave the YLs alone long enough to get his 500 watts in operation. 2BZJ has installed a 69 foot lattice mast (a la QST) 2FC has trouble picking up traffic and keeping his dist. in operation. 2BXD is at Camp Silzer at Sea Girt operating BJ5. 2BAW has been heard in all

districts with the exception of the 7th with 50 watts which will be increased to 100 watts soon. 2BKR is a live station who keeps a continuous watch. 2CRP lost his antenna in a recent storm and will be off the air until a new stick is erected. 2EG is off for minor repairs but promises to be back later with renewed pep. 2CMK is in deep mourning as his dear little 5 watter went west.

Traffic: 2CQZ, 83; 2BAW, 66; 2CMK, 56; 2WR, 55; 2CPD, 43; 2BKR, 42; 2AUH, 32; 2AEY, 26; 2CYQ, 23; 2CYW, 23; 2BEO, 22; 2CNJ, 22; 2CQD, 21; 2BZJ, 20; 2CRD, 19; 2CRP, 17; 2AEF, 16; 2CRW, 16; 2CTQ, 15; 2BXY, 15; 2QS, 10; 2FC, 9; 2AGB, 6; 2CBD, 1; 2ADU, 32; 3CBX, 19; 2CGR, 13; 2ATE, 12; 2AJF, 12; 3BLZ; 3BAY, 59; 3AIH, 52; 3BEI, 15; 3BTQ, 7; 3BWJ, 6; 2BGI, 56; 2CGK, 2; 3OQ, 13.

CENTRAL DIVISION
R. H. G. Mathews, Mgr.

ILLINOIS—The general condition seems to be improving and more stations are coming on the air. A great deal of the summer rebuilding has already been done and the majority of the stations are finding out that the QRN is not so bad when they get into it right.

Several daylight routes are working from Chicago to the south and some of the stations in dist. No. 3 have completed this route to Kansas City. It is a cinch that scheduled routed are THE thing.

Everyone is asked to listen for the "Big Bill" which is described elsewhere in QST. 9BP is the operator, the call is WHU. Illinois is proud of the fact that the "Big Bill" started in Illinois and in the Central division.

Dst. No. 1: The report is rather slim. There is not much to report except a heavy electrical storm did much damage to several amateur stations and traffic for the month has dropped off.

Dist. No. 2: 9CTF not only leads the district, but the whole state with 540 messages. He has daylight schedules east and west across the state and north and south to Kansas City, etc. That is the kind of work we like to see. 9BRX reports that he is using series condensers in aerial, and C.P. and has been heard on both coasts, Panama, Cuba, etc. using the reliable 1DH circuit. A new 70′ mast will soon blossom out in the back yard at 9BRX. 9ECB is doing very good work. 9AHQ has made nearly all of the summer changes in his station and will be on regularly. 9BUK is again doing some work, after the convention, we didn't expect to hear from him for a while. 9PQ has moved his station to his home in Pontiac and is one of the best stations in the state. 9PQ has a daily schedule wih 9DIW at 5:30 P. M. 9DLO is again off the air because of a burned M. G. 9AHO will have a new installation. 9ARM is still QRW at various jobs. 9CA is so busy editing the "Illini Oscillator" that he hasn't been on the air much. Hi. 9AIC has been doing splendid work when time permitted and has worked 9XAX on waves as low as 80 meters. Not so long ago we can remember when 9AIC thought that waves below 230 were no good.

Dist. No. 3: D.S., 9MC, is on a western tour and the reports were sent in by Fraley, one of the ops. 9MC left Los Angeles on the 21st and after visiting all the sixes will call on a few of the sevens. Everett, Washington is one of his stops. 9DJG leads the district. 9CLZ reports hearing VDM ever since he left. He is on daylight route to Kansas City. (FB, OM.) 9ATT is on the air a great deal.

Dist. No. 4: The D.S., 9DQU, is working the west coast frequently on two fifties in a master-oscillator circuit and pure D.C. on the plates. The R.I. got liberal and extended his license down to 150 meters. (He did that for 9PQ and 9CA, also.) 9DHZ has junked the spark and is on with a 50 with A.C. on the plates and a new 80 ft. mast graces the back yard. 9CLJ is back on again with a new 50 and "S" tubes. 9BEB worked 4TJ in sunlight while using two 201As with loss input. That shows what D.C. will do. 9KX and 9VV report little activity. Why?????

Dist. No. 5: District No. 5 has a new D.S. in J. R. Tate, Harrisburg. We have a new A.D.M. but for some unknown reason he failed to report anything but message totals. 9DZG leads and the others that report are as follows: 9AYX, 9BDA, 9CED, 9EBQ, 9CIZ, 9AYB, 9AUS and 9DLR. Better next time, fellows.

Dist. No. 6: The D.S., 9AKU, has been vacationing at Morris, Ill., and was over to visit the A.D.M., and both went on a little tour of nearby stations including the "Big Bill" which was at that time going down the Canal. 9AKU has a busted plate transformer at home and is marooned out in the wild woods near Morris with nothing by a B.C.L. set. 9BHD is on in daylight and is moving traffic in short jumps. 9ALW every QRW picking cherries and did not handle much traffic. 9EJH leads the district with 50 msgs. and on spark at that. Oh, well some fellows still insist on using spark. 9AQD has moved to Wisconsin. (Sorry to lose you, OM.)

Dist. No. 7: Bill Schweitzer is sailing on the "Big Bill" so RC sent in the report which was some late! 9EEG is remodeling his station and constructing a new 75 ft. tower. 9ASA is doing good work. Evanston and Illinois are very proud of E. C. Page, 9BP-XBF, as he was chosen as the opr. on WHU, the "Big Bill." 9CFS has been doing the best work in the Cicero territory having handled 56 msgs. and working 157 DX stations in 5 nights on three 201As. The 1000 volts on the plates will soon be replaced with storage batteries. 9EJX has also been busting thru with his 20 watts. 9QD is one of the new hams that has been doing good work with two 5-watters. 9DWX is clearing regularly every morning before B.C. hours with 9CII in Milwaukee. 9CTT will be moved to 9CZV this month. 9BE did the best traffic handling in the Chicago district this month. 9CVF's station was struck by lightening and practically everything was destroyed. Same thing happened to 9LF in Peoria. 9CVF is back again with 10 watts. 9CLX's mast was blown down so he is putting up a 78 ft. lattice tower. 9BNA has moved to new location. Five ops. at 9BNA should move traffic. 9COW is still trying to get a D.C. tone. Better get a cream separator and throw that chopper out.

Traffic: 9CTF, 540; 9BRX, 156; 9BE, 120; 9AAW-9XBD, 74; 9ARF, 63; 9CFS, 56; 9DWX, 55; 9BWO, 50; 9ECB, 47; 9ASA, 47; 9EJX, 47; 9AHQ, 37; 9CVF, 36; 9DZG, 35; 9BNA, 34; 9AWU, 33; 9AIC, 32; 9DQU, 31; 9AYX, 28; 9BUK, 27; 9PQ, 27; 9DJG, 24; 9AUS, 24; 9BIZ, 23; 9BHD, 20; 9BEB, 19; 9CLJ, 18; 9EBQ, 16; 9ATT, 16; 9CMN, 15; 9MC, 15; 9ABB, 13; 9CA, 12; 9AHJ, 12; 9CFK, 12; 9DBP, 12; 9CYZ, 11; 9CLX, 11; 9CRX, 10; 9XBA-9CD, 9; 9DND, 9; 9CLZ, 8; 9COW, 8; 9BWP, 7; 9VV, 6; 9AYB, 6; 9AQD, 6; 9EBQ, 6; 9CVS, 6; 9GP, 6; 9QD, 5; 9BTF, 5; 9CIZ, 5; 9DVW, 5; 9DLO, 4; 9KX, 4; 9ARM, 3; 9ALW, 3; 9BZQ, 2; 9DJR, 2; 9DKK, 2; 9EJH, 50.

KENTUCKY—9APS has moved his big bottle from his shack to the second floor of his house and radiation seems to have gone up accordingly. 9UZ is remodeling especially for RR Emergency work. 9CSO is conducting some experiments on Echo river in Manmoth Cave with fine results. Echo River is 200 ft. below ground. 9DWZ has constructed an Ultra-Reflexed-Auto-Super-Neutro-get 'em-all, but the sad part of it is that it won't perk below 190 meters. There are two new stations in Princeton, 9BIF and 9BBU, which we understand are ready for operation. 9CON is going good. 9BCE, after blowing his M.G. "Steen" times has changed to transformer and CRAC on plates. 9ELL has an 80 ft. tower well under way. 9DTT has erected a 65 footer that bids fair to good DX. 9OX has departed this single life but says it is "not Good-bye, boys." 9WU is in Europe paying some of the foreign hams a visit.

Traffic: 9BAZ, 21; 9WU, 5; 9MN, 4; 9CUR, 2.

OHIO—Dist. No. 1: 9CCI is now on with a 50-watter.

Dist. No. 2: 8AAJ handled all the traffic for this district. 8XT, 8ZE, 8YAE are off the air for the summer. 8RY has a permit to use 150 meters with pure D.C. and was heard by Z-4AA using 1 fifty W.E. tube, and is now installing a 4 coil Meissner. 8LT is coming on with 1 50 in a couple of weeks.

Dist. No. 3: 8BKM leads the district with 56 messages. The Cleveland gang is still much alive.

8BVR has his 250 jug going again. 8RJ is doing fine DX with a new receiver and a 50-watter. 8DPN, a new station, also is doing fine work. 8CUR will operate 8BVR while the latter is in Europe. 8BNH and 8HN are using coupled Hartley now and stepping out in fine shape. 8DMX only consistent station is Mahoning Valley at present.

Traffic: 8BHE, 137; 8CWR, 127; 8BMB, 110; 8BKM, 56; 8AQ, 50; 8CNL, 41; 8AAJ, 55; 8RJ, 40; 8DPK, 36; 8ZAB, 25; 8DPM, 24; 8BVR, 22; 8BNH, 20; 8CMU, 17; 8ER, 15; 8CAB, 14; 8MD, 14; 8CVH, 20; 8CCI, 12; 8BCF, 12; 8HN, 10; 8APP, 8; 8DAE, 7; 8ALW, 6; 8BOQ, 5; 8AWX, 5; 8CNR, 4; 8DCF, 3; 8AGP, 42.

MICHIGAN—Dist. No. 1: 8AMS made a vacation trip through the upper part of the state and saw some of the hams from across the straits; reports two or three hams in Marinett, Wisc., who promise to take north stuff this fall. Also Gladstone, Mich., will be QRV for traffic most any time now. 8ATX will be on the air with his old reliable. 8DAT is out till new M.G. arrives. 8DIL is putting up a new mast. 8DGT, a new station at Bay City is now reporting each month.

Dist. No. 2: 8YN is closed for summer vacation, will probably re-open in September with a new call. 8BNC is just recovering from a two months illness. 8CED will be on in the fall with a new supertransmitter. 8NX is rebuilding a transmitter. 8CLG, on with 50 watter and a new 70 ft. mast.

Dist. No. 3: YL's and QRN have taken a strong hold on the hams of this district and they are not on the air. New apparatus and larger aerials are going up all over the district. A meeting of all station hams in this district will be held early in the fall to lay out definite routes and schedules to incorporate each and every station in this district.

Dist. No. 4: Only reports turned in are from 9CE and 9AEN.

Traffic: 8CED, 95; 8ARV, 73; 8DDT, 70; 8DCW, 56; 8BUL, 51; 8DEP, 47; 9CE, 36; 8CLG, 35; 8BUC, 32; 8DGT, 22; 8DIL, 22; 8DFB, 22; 8DOO, 21; 8AUB, 21; 9AEN, 21; 8CAP, 20; 8AQA, 14; 8ZZ, 12; 8CZZ, 11; 8CPY, 11; 8DJH, 9; 8ZF, 7; 9DZV, 6; 8NX, 3; 8WA, 3; 8AMS, 2; 8BDR, 1; 9XM, 1.

WISCONSIN—Dist. No. 1: 9CII was one of three ninth district stations to be heard in the Pan-American Tests. 9DXS has erected a new pole and worked all but sixes and sevens in the first month. 9BTK is doing good work and will continue in operation all summer. 9HW is on the air again at new location with a 70 ft. lattice tower and two transmitters. 9AFS says things are running along pretty good but traffic is scarce. 9VD the A.D.M.'s station is on again with one 50 and operates on 180 meters Tuesdays, Thursdays, and Saturdays, eleven to two.

Dist. No. 2: 9CCF has been laid up for a month with an operation but is coming along nicely. 9EGW has been building himself a new 80 lattice mast this month. 9EAR had his vacation this month but managed to get a few off the hook. 9CWZ has just finished re-building his station and says reports are coming in fine. 9CWP is on the air again and will be on all summer. He has been operator at 7IF.

Dist. No. 3: 9AGT would like reports on 9BRO Boy Scout 20-watter. 9DCT is QSO 5 states daylight or loose coupled Hartley. 9ALA is in line for an O.R.S. appointment. DX 13 states on low power. 9CZE 50 watts now and 5 amps. He is doing good DX out of Appleton. 9AEU reports that 9AJX is operating 9MK at Chambers Island and that 9AQQ is minus his last five watter. 9BVA has been around the circuit with 9CIU and will extend his visits to St. Paul. 9BQG is going on a vacation and reports N.D. in his station for a month. 9CJI is working out of town, consequently, a small report. 9DHG wonders when 9VD's C.D. transformer will be completed. 9BSA is learning the Printer's trade. Maybe he will print himself some spiffy cards. 9EMD is rebuilding the entire station. 9ADP reports by air but no news. 9EHS has opened up with a new antenna system and a 50.

Dist. No. 4: 9ALI maintains a regular daylight schedule at 12 noon and 5 P.M., and doing the most consistent work in his district. 9CFX reaches out better putting out 2 amps with a 15-watter. 9AZN was out of the air the first part of the month due to installation of a 50 watt master oscillator. He says radiation efficiently and DX much better than a former 20 watt colpitts. 9DST of Mauston has given the rectifier a bath and is on the air again Saturdays and Sundays on 190 meters.

Traffic: 9CLI, 82; 9CCF, 82; 9DXS, 68; 9AGT, 67; 9EGW, 65; 9ALI, 63; 9BTK, 60; 9DCT, 54; 9BMV, 52; 9EAR, 33; 9ALA, 28; 9DTK, 24; 9HW, 18; 9CZE, 16; 9EAU, 16; 9CFX, 16; 9BVA, 15; 9EQG, 15; 9AFZ, 14; 9CWB, 13; 9CJI, 12; 9CXT, 11; 9DHG, 11; 9BSA, 10; 9AZN, 10; 9VD, 8; 9EMD, 8; 9PJ, 6; 9DST, 5; 9BMY, 4; 9BGE, 4; 9ADP, 3; 9EGH, 2; 9EHS, 1.

SOUTHERN INDIANA—9BDB is on with 50 watts and has a schedule with 9EJU and also east const. 9PD and 9QC are back from Purdue and going strong. 9TA just put up an 84 foot mast. 9TG is going regularly and can be depended on to deliver messages. 9UR changed over to the colpitts circuit and now claims that the earth is too small to give him a good test on his DX. 9EAD is being heard again after a short vacation. 9EJI, 9VC, 9ARP, 9CYQ and 9AUD are on regularly.

Traffic: 9BCC, 125; 9EJI, 100; 9BDB, 62; 9AUD, 36; 9PD, 10; 9BJL, 10; 9CYQ, 8; 9BVZ, 7; 9EAD, 6; 9AXH, 1; 9UT, 1.

NORTHERN INDIANA—9MM is getting his things put together again and will be using a sinc. rect. and two 50 watters. 9DHJ says everything going ok and that's all from him. 9EFZ has a new 50 watter but can't seem to get any DX. 9EJP is getting 15 watts working in fine shape. 9DYT is not on much and says he is saving his tube for fall. 9BON says he worked 6 districts in one night, all on two 5 watters, 1000 watts on the plates. 9DWA is re-installing his set and will be on the air in a couple of weeks. 9CP is still using two W.E. fifties and radiating 6 amps in two wire aerial. He is saving his 250 for fall.

Traffic: 9BON, 76; 9EFZ, 22; 9CP, 6; 9DYT, 2; 9DHJ, 17.

DAKOTA DIVISION
D. C. Wallace, Mgr.

NORTH DAKOTA—9AEJ has been on the air and the new 70 foot tower works very fine. Plate glass insulation and the best of materials is being equipped throughout, and although the rated tube output is about 10 watts, fine work is being done.

The A.D.M. is making a tour of several states on his vacation, visiting the principal amateur stations along the way.

MINNESOTA—The entire state seems to be snowed under by summer projects having no bearing whatever on A.R.R.L. activities, and the report turned in this month is small indeed. Yet, while the message total is small, practically all stations are undergoing the regular summer overhauling and fall will see many new and better stations on the air.

Dist. No. 1: Traffic is very light and few stations are on the air because of bad static weather and operators on vacations.

The new D.S. of Southern Minnesota, N. H. Schensted, 9CPO, is going to put that district through its paces. 9CAJ and 9DIJ are combining their stations, the former having blown his 5 watters. 9DDP and 9BVS are doing good work on fairly low power, as is also 9MF, who is on occasionally. 9BFU and 9DMA are both moving their stations, the latter having blown his two fivers. 9MB and 9ACT are coming on he air soon and 9BAB has gone off for four years, having sold his transmitter to 9ALD and joined the Navy. 9CMS and 9EGG, the latter on I.C.W. are on the air regularly. 9EGG is also the new T.M. for the S.M.R.A. Ex-D.S. Canfield, and ex-C.M. Caveny of Luverne are on their way to the coast listening for amateurs on the way with low-loss tuners.

L. C. Smeby, the new D.S. of district No. 3, reports things fairly quiet in his district. 9TH is installing Edison "B" batteries for plate supply. 9BMX is moving to new QRA, while 9APE, his old side-kick is in Alaska selling B.C.L. stuff to the Eskimoes. 9DEK is a new comer and is starting

out right with battery plate supply. 9DEV and 9HM (ex-9DGW) have closed down until fall. Stations having O.R.S. appointments must remember to turn in their certificates if they are to be inactive for two months or longer. 9ZG-9APW is back on the air again, but spends most of his time listening for WNP and VDM, with only sparing use of the transmitter. 9ZT-9XAX worked VDM and WHU.

Traffic: 9DOE, 123J; 9CO, 46; 9EGU, 34; 9EAU, 17; 9DDP, 26; 9CA, 25; 9DMA, 23; 9MF, 21; 9CMS, 11; 9EGG, 6; 9AXS, 3; 9CPO, 3; 9BIS, 50; 9BFI, 28; 9DPX, 22; 9RQY, 13; 9CMM, 20; 9BPN, 10; 9BTL, 10; 9BTT, 10; 9BPY, 7; 9ZG, 6; 9DYZ, 2; 9ZT-9XAX, 86.

SOUTH DAKOTA—Good weather is showing up already and a few stations are on. 9BOF leads in traffic. He has a good stick and will improve his radiating system. 9CBJ's 80 footer down and had everything fixed so it smashed his 50-watter and meters. 9UX handled Associated Press reports to Sioux Falls during the Firemen's Convention. 9AVZ got a replacement on the big jug and built up a good panel set with sink rectifier and hopes to put it on 9DWN aerial. 9DBZ, 9CKD, 9BRI, 9CKT and 9DQY are on once in a while.

Traffic: 9BOF, 43; 9UX, 22; 9CKT, 4; 9CJS, 38; 9DBZ, 8; 9CKD, 6; 9BRI, 1.

DELTA DIVISION
W. W. Rodgers, Mgr.

MISSISSIPPI—5BQ, a summer camp station near Meridian leads the Delta with 214 real messages. 5AGS and 5AGV, with others, operated 5BQ and

5ANC, Jr. "breaking ground" for the new station at "Hearn Haven."

did not work their own stations. 5QZ ranks second with 162 to his credit. 5ALZ shows up very nicely. 5AKP is rebuilding, but found time to operate a part of the month. 5KR, on the Gulf, says, "Msg. traffic fast going west." 5NJ has a new 14 pound junior brass-pounder.

Traffic: 5BQ, 214; 5QZ, 162; 5ALZ, 90; 5AKP, 26; 5KR, 16.

TENNESSEE—D. S. Adcock of the Third District asked all his stations to report directly to him. (This is FB, gang, do it—D.M.) 5AKW, 5AOT, 5AQR and 5AMF are operating consistently. 5KA is rebuilding again! 5AIY reports good traffic and summer DX.. 5NT has subdued his sink. 5AMF has a radio engineer op now; his traffic has jumped considerably. 5CN telegraphs his report—15 handled. 5AAZ, 5DA and 5ZB reported on time, but no traffic was handled.

Traffic: 5KA, 108; 5AIY, 71; 5APC, 58; 5NT, 56; 5AMF, 54; 5CN, 15; 5ANV, 10; 5ES, 10; 5WO, 14.

LOUISIANA—No traffic handled or reported. 5KC says nothing going through his state.

ARKANSAS—Lots of reports, but little traffic. 5AW-XAB the outfit. 5EA, 5BI, and 5ANW, also 5JB reported.

Traffic: 5WK, 14; 5AW-XAB, 11.

MIDWEST DIVISION
P. H. Quinby, Mgr.

MISSOURI—Traffic in East Missouri suffered interruption this month from heavy winds and small tornadoes. Many stations are rebuilding. Traffic is at low ebb in West Missouri, as many of the fellows simply cannot work through the QRN except in daylight. Some good work is being done before sun-down.

Dist. No. 1 and dist No. 2 both sent in excellent reports. They are both new at their jobs and are to be congratulated for their good work. The new O.R.S's are all on the job and show pride in their new appointments. Many stations are doing good work who will not be reported until they have secured their O.R.S. appointments. Get busy on your applications, fellows!

Traffic: 9RR, 5; 9ADC, 93; 9AAU, 24; 9DCW, 15; 9DXN, 15; 9DWK, 2.

KANSAS—Only O.R.Ss receive mention, gang, so get yours now. Many applications are in and more coming. 9BRD and 9BIO put out lots of messages. 9EFU does great work with 50 watts. Two big bunches of Southern Kansas Gang were in Wichita taking exams. Many new first-grade amateur and commercial ops down there now. 9AIM lost two 80 foot masts in big storm, but will be on again September 1st. 9CCS is still pushing through QRN. 9BVV is experimenting. 9BVN leads the state in messages handled. 9CFI is trying to tune up his 250 watter. He is getting 7 amps now. 9CCV is marking time until winter. Stations to receive O.R.S. appointments this month were: 9CCS, 9EHT, 9AIM and 9BVN.

Traffic: 9CCS, 30; 9BVV, 51; 9DLM, 65; 9BVN, 81; 9CFI, 66; 9EHT, 15; 9AIM, 37.

NEBRASKA—The A.D.M. is doing his DX on the business end of a fishing pole up in Minnsota this month, so the reports are coming direct. (Good work, gang!)

9AFR is appointed C.M. of Lincoln. D.S. Palmer, of dist. No. 2 has resigned. He has too many other interests now. (We don't like to lose you, Om, but—.

Dist. No. 1 has an excellent report. 9DPS is opening up in Grand Island. 9AWS is out of town for the summer. 9CGS dismantled his tower to comply with city ordinance, but is getting out on a 20 foot antenna. (It is hard to keep a good man down—DS.) 9ATC reports that the rubber stamps messages don't get through the QRN but the real ones QSR in good shape. 9BR blossoms out with a good summer schedule. 9EAK is making 'em a low-losser. 9ATL is back again after loss of a tower. 9EHW is back with a stronger "poke" than ever. 9PN is starting up an Unadilla. 9BLK is going again at College View. 9BXT-(9CBK-9EAK-9ELP make a perfect QSR west.

Traffic: 9CGS, 5; 9CIM, 6; 9ATC, 5; 9BNU, 53; 9EB, 13; 9AFR, 51; 9AK, 7.

IOWA—9HK expects to be operating again in September. 9BCX says that the message delivery is getting better. (Glad to hear it.) 9CSB reports lots of business QRM. He routes msgs south through 9DSL and north through 9BPF. 9CGY says that QRN is the Bee's Knees and N.D. on DX. Also that the YL has to have some attention. Hi. 9BWC is selling shoes in between messages. 9ARZ's whole antenna blew down in a recent storm so probably won't be on this summer. 9DSL reports that traffic has picked up a little. He handles traffic regularly with 9CSB, 9AJE, 9BCX, 9BRU, 9EBU, 9DIX and 9CKS. 9DKY, 9AMI and 9CS have just been appointed O.R.S.

Traffic: 9BWC, 6; 9CSB, 10; 9DJA, 2; 9DSL, 41; 9BCX, 114; 9CS, 10.

NEW ENGLAND DIVISION
I. Vermilya, Mgr.

MAINE—1AUR has received three new reports from England and one from Mexico. He is American Correspondent for the French Ham paper "Journal des 8" and would like to get European lists to forward. Very little doing on the air this month.

WESTERN MASSACHUSETTS—Traffic totals are very low and many stations complain of scarcity of messages. Most Springfield stations are inactive; those operating being rather inconsistent. Worcester seems to have a large number of stations working and handling traffic well. 1ABG reports working 35 miles with a 201A and loop. 1VE is a new station in Leominster. 1BCR has moved to Princeton, Mass. and has a new call 1RF. 1BFQ is a good relay point from Worcester to Boston. Lee Bates has resigned his position as D.S. of Worcester. He will continue to carry on the work until a new man is appointed. 1BVR, who just worked WNP, will be on the air for traffic until September 20th. Pittsfield traffic is being handled by 1ARE. A. S. McLean, 1JQ, A.D.M. for Western Mass. has also re signed. The work will be carried on by Miss Daniels until a new A.D.M. is appointed.

EASTERN MASSACHUSETTS—The best station this month was 1AVF with a total of 49 and he is doing some very fine DX for this time of the year. He rec'd four cards from England, 1 from the 6th, and 1 from the 7th district, so he's maintaining constant DX the year around. 1RR is completely rebuilding his station and will be at a new location when he opens up again. 1BBM is another that is complete remodeling both transmitter and receiver. 1AQY and 1CIT are away on vacations so no traffic from them this month . 1BZQ handled 32 and is operating the same hours as last month. 1MM is on pretty regular but says things are very slow. 1ZW had tough luck this month, his aerial was on Mother Earth most of the time. 1AF-XJ is closed for the summer and will be reopened in the fall with a better and bigger set than ever. 1ALL is another vacationest. Owing to the very few stations on, traffic seems to be well shot to pieces in all directions. 1ZW and 1CJD were made O.R.S.

VERMONT—About the same old story—just as many stations, but all of them less active. There are two new D.S's, R. P. Slayton, former A.D.M. in the first district and C. T. Kerr of Poultney in the second or southern district. 1LA, H. H. Rowe of Springfield, has been sent his O.R.S. certificate. The two districts are planning to have a contest to see which is the most alive and active, etc. Just at present the second is ahead. 1APU is putting in a 1KW tube set. Hi. 1AC reported in Pan-American tests, the only Vermont station so far.

RHODE ISLAND—Miss Mildred Lorentson, LAID, our acting D.S., is quite the "berries". She sends us an excellent report this month. 1ANH is going to sea as an op, so his station is being dismantled. He has done good work and we hope to have him with us again some day. (Good luck to you, OM!) 1ABP is rebuilding and installing "S" tubes for his two fives. 1ABC is on Mount Hope as commercial op. 1GV has rebuilt and now has a station that would make some of the commercials take a seat in the back row. He has also installed a new antenna and counterpoise system. 1AWE won't be with us until fall. He has gone to his summer place which has no juice. 1AID took a two week vacation and is now back pounding the key with renewed vigor. He holds a schedule every morning with 1BVB and pushes quite a bit of traffic through. 1II is in Europe and intends to get a set going over there as soon as possible to listen for the gang. We will probably get a list of calls from him soon so watch out fellows. 1OW has installed four fifties. Whew, bet he'll kick up some dust this winter! 1BIE is on and doing good work with six fives as per 1GV. We are glad to report that a lot of the old timers in Providence are coming back into the game again this fall. Well—we need 'em all. 1BVB is hanging away as per usual. 1AAP does not get on so much now due to QRM from the farm, but he did not fail to report. Nothing doing in Newport until fall.

CONNECTICUT—It seems to be too hot down here to wear the cans and handle traffic, consequently, very few stations are on the air. 1FD, who has kept Norwich on the map most of the summer, has closed down until September 7th. 1KV is on the job in Middletown. 1AH and 1AWY are about the only ones doing their bit in Waterbury. 1MY is the only active station in Hartford at present.

Traffic: 1AIR, 8; 1AVF, 49; 1ZW, 19; 1BZQ, 32; 1KY, 22; 1LM, 21; 1RR, 23; 1AJG, 8; 1CQM, 10; 1AEY, 2; 1AOZ, 2; 1AID, 49; 1ANH, 24; 1ABC, 5; 1AWE, 2; 1AWV, 33; 1GV, 25; 1OW, 20; 1BCC, 24; 1BIE, 20; 1BVB, 90; 1AAP, 9; 1KV, 32; 1BJG, 24; 1AH, 28; 1AYR, 18; 1AWY, 42; 1FD, 28; 1MY, 60; 1AWW, 27; 1BVR, 23; 7ARE, 28; 1DB, 26; 1BIP, 22; 1MM, 11; 1AGT, 14; 1UM, 6; 1CIM, 8; 1LC, 8; 1ASU, 51; 1AJK, 17; 1ABG, 2; 1BLX, 2; 1BBP, 30; 1AAL, 7; 1ALK, 36; 1AUC, 10; 1AUR, 36; 1BHR, 11; 1BNL, 11; 1BTT, 20; 1GA, 34; 1KX, 10; 1PD, 6; 1VF, 5.

NORTHWESTERN DIVISION
Glenn E. West, Mgr.

Conditions in the Northwest are all that could be expected for this season of the year. Many stations are heard on the air every night in spite of the QRN. Our traffic totals do not break any records this month but still the reports show that a good number of the reliable stations are on the air with regularity.

MONTANA—A few of the old reliables are heard regularly. 7CO handled the most traffic this month. 7IF is still at it but reports QRM from the Y.L's. 7IT laid away a couple of 5-watters. 7ACI has been trying a lot of new transmitting circuits and reports some very good results. 7AGF hasn't missed a night on the air in two years. He works DX right through the QRN. 7WP is remodeling everything for the coming seanson. 7ZU has been on during the latter part of the month.

Traffic: 7CO, 39; 7IF, 35; 7IT, 31; 7AGF, 24; 7ACI, 18; 7ZU, 14; 7WP, 5.

WASHINGTON—Traffic has dropped off 50% during the month, due to the fact that many of the fellows are away on vacations and others are remodeling their stations for the winter. 7NO is on every night with 50 watts and is still QSO Alaskan 7AEB. He is the only station that 7AEB has been able to work in several weeks. 7PZ holds second place in the traffic handling. 7NO is first. 7AF still maintains a schedule with 7ACI in Montana. Many stations are putting in more power and this fall will see a great flock of 50-watters burning up the air. Down in Aberdeen we caught 7LH breaking in a YL op. It almost broke him up as all his tubes are out. 7BM was on a few nights and helped kill the traffic slump. 7KV is putting up a new 75 foot mast. 7NW is back with 50 watts and is doing fine work. 7SF sold out his radio store and is moving to Raymond. 7AHA, 7ADR, 7AGZ, 7SH, 7ADF, and 7AFB are on occasionally. 7GE, 7QC and 7RY of the inland stations are preparing for the coming season. 7DM has three fifties running on Willard Storage P's. He ought to make DX records. 7IX, 7MI, 7MV, and 7OM will all be going his fall. O.R.S. certificates have recently been issued to 7ADR, 7AGZ, 7GR and 7VN. 7FD is rebuilding. 7ADP is moving. 7AEZ and 7VM are both at sea.

Traffic: 7NO, 67; 7PZ, 64; 7RY, 48; 7MI, 43; 7GE, 43; 7AF, 42; 7AIB, 42; 7BM, 42; 7ALI, 30; 7QC, 26; 7OM, 24; 7VN, 24; 7DM, 21; 7FN, 17; 7GR, 16; 7AHA, 12; 7ADR, 11; 7IX, 11; 7NW, 10; 7BJ, 10; 7KV, 9; 7MV, 6; 7AFB, 1; 7AEZ, 21; 7MA, 9; 7FD, 7; 7VM, 3.

OREGON—There has not been much activity in the state during the past month due to too many stations off the air for rebuilding. Most of the old men were away on vacations this month. The schedule with 7IW-7ZW has been cancelled temporarily. The only new schedule is one with 7MF and 7WM. In Portland the reliable stations

are 7AV, 7CW, 7AKK, 7ALD and 7AKH are also consistent stations in the north. In the eastern part of the state 7AJQ, 7ABY and 7JH are still pounding the brass with 7ACM, 7MF, 7SY and 7JU in the southern part.

Traffic: 7ALD, 19; 7AKH, 6; 7JU, 15; 7SY, 12; 7AJQ, 35; 7JH, 17; 7ABY, 43; 7MF, 48; 7FR-7ACM, 13; 7TQ, 15.

IDAHO—Hooray! Idaho now has an operator of whom they are mighty proud. Her name is Harriet Ellsworth, her call is 7SI, and her address is Boise. 7OB has been helping her put her set up, but once in a while they neglect that important

work and go to a show. 7OB has been the most consistent station in Idaho. 7RQ is coming up with a new set to help traffic through Boise. 7ACF has been doing such work as to rate him an O.R.S. 7AHS is heard practically every night working DX and handling traffic. 7GW is using a new low-loss that works FB. 7GX and 7KC are re-building their sets for early winter work. 7IU rips through in great shape. Several stations were heard working 7QP in Northern Idaho. 7IO is on practically every night but has an awful time getting traffic through the powerline QRM. 7LN is down on 172 meters and finds that region better than higher. Several of the boys have been taking vacations.

Traffic: 7LN, 38; 7IO, 31; 7OL, 2.

PACIFIC DIVISION
M. E. McCreery, Mgr.

The work of weeding out "dead timber" and replacing it with new is still going on. Many new faces will appear in the personnel of this division. Three new A.D.M's. were appointed during the month to fill the vacancies. Southern California, districts 1, 2, and 3 will be handled by D. M. Brockway, 6PL; 4, 5, and 6 come under P. W. Dann, 6ZX, who is in charge of Central California; Northern California comes under S. Runyon, 6AGE, taking districts 7 and 8. .All three are live men and organizers that mean business!

Nevada and Arizona will fall in with the scheme and will be all set when the good weather comes.

6ZH reports acr much and QRN makes radio work impossible, but the gang is rebuilding for the fall. Mott is still fishing—we don't blame him —we envy him.

In district Nr. 2, traffic is moving better than ever. A bunch of new O.R.S. have been appointed which accounts for the good work. The following have been appointed: 6CMU, 6CMS, 6BEG, 6BRA, 6ZBB, 6ALG, 6BRF, 6PL, 6MG, 6MH, 6BVG, 6NB, 6CBB, 6AAO, 6CHV, 6CNH, 6AKQ, 6ALK, 6ZBZ, 6BWP, 6QL, 6BLW, 6IV, 6ZP, 6GT, 6CAE, NAGK, 6AFG, 6US, 6ZBE, 6AJI, 6BLV, 6VL, 6ADT, 6BFW, 6AHD, 6CGW, 6BBQ. Any of the above stations are relinble for traffic work and quick delivery and they all like to handle messages. 6AAO is the new C.M. of Los Angeles. 6BJJ has been appointed C.M. of Glendale.

Because of no reports from the D.S. of Nr. 4, 6AVV's appointment as D.S. has been cancelled. Regular reports from the new ADM's will be forthcoming next month according to their own promises. FB!

Traffic: 6CLZ, 4; 6CKC, 8; 6BUY, 15; 6AFG, 26; 6VL, 25; 6ADT, 27; 6ALK, 5; 6AGK, 31; 6QJ, 3; 6LJ,, 21; 6CAE, 42; 6CNH, 15; 6BRA, 12; 6CBB, 15; 6PL, 93; 6NB, 50; 6CMU, 49; 6MG, 20; 6AAO, 34; 6CGL, 1; 6GT, 15; 6BAU, 15; 6ZP, 12; 6BMV, 2.

ROANOKE DIVISION
W. T. Gravely, Mgr.

Quiet hours, QRN, and excessive heat seem to have run the gang to the tall sticks in this divison. So few are sticking to their guns and doing good work. Some of the gang have changed to the four coil Meissner and doing good work with it.

NORTH CAROLINA—Everything in this state seems dead. 4RU promises a 100-watter in the near future. 4BX's mast is still down. 4FT is remodelling. 4SU got married.

WEST VIRGINIA—Report seems to have gotten lost in the mails. However, we got another small one and shows some activities. Stations in this state suffered from high winds recently and have not got back on the air. 8DKB lost his brother by drowning. (Sympathies).

8ABQ, 18.

Traffic: 8AM, 10; 8DOI, 7; 8WZ, 5; 8BBM, 3;

VIRGINIA—3BMN and 4JR handle only those messages that are transmitted under the new numbering system. (FB,OM.) 3AUU works 1st, 3rd, and 4th district with his 5-watt four coiil Meissner. 3AOT is getting his aerial up again. 3ABS stood examination and is getting the new 10 watt set going. 3SG is coming back. (Told you so—A.D.M.) 3BVL is on the air again. 3CKL had tough luck, broke a 50-watter, blew up his last five-watter, damaged voltmeter—all on Fourth of July. Where do you get that stuff. 3BGS, a new station at Bristow, is going good. 3CKK, our newly appointed D.R.M. has just turned out a map of Virginia which is a peach, and will appear in an early issue of QST. All O.R.S.'s appear on this map and a copy has been mailed to each of the Q.R.S. which is greatly appreciated. No news from Norfolk or vincinity.

The following D.S. appointments have been cancelled, effective this date, and we are anxious to have new men for these places. Send in your applications, please. Dist. No. 3, W. C. O. Brine, Jr., 3MO, Richmond, Va.; Dist. No. 4, T. J. Selph, 3TJ, Richmond, Va.; Dist. No. 5, D. W. Lewis, 31W-3XAR, Clarendon, Va.; Dist. No. 6, Fred T. Bradley, 3BHL, Crozet, Va.; Dist. No. 7, H. L. Kellar, 3ASP, Staunton, Va.; Dist. No. 8, C. M. Owen, 3APR, South Boston, Va.; Dist. No. 9, C. C. Higgins, 3HL, Galax, Va.; Dist. No. 10, S. J. Gundry, 3AOV, Stonega, Va.

ROCKY MOUNTAIN DIVISION
N. R. Hood, Mgr.

9CAA and 9AMB
C.W.
139 Msgs. each

COLORADO—There are no outstanding features to report this month. Stations are working to the best of the operators ability. The usual summer disorganization and rebuilding is in full progress. 9CCA and 9AMB tie for most messages this month and is a good total for this time of the year. 9CPU has been issued an O.R.S. certificate and that of 9AVU has been cancelled due to the discontinuance of this station.

Dist. No. 2: All the stations in this district have been on regularly and are steadily moving traffic. Aside from the regular routine there have been no special features pulled off in this district.

Traffic: 9AMB, 139; 9BUN, 20; 9CAA, 139; 9EEA, 2; 9CDE, 7; 9CHT, 19; 9CLD, 45; 9DFH, 6.

UTAH—Salt Lake has been the mainstay of this state this month. Traffic has moved through regularly through the station who have stuck through the hot weather. No reports from district No. 2. There will be a new D.S. appointed for this district soon. The election for the new A.D.M. for Utah will come off soon as ballots can be distributed. 6CKI has been issued an O.R.S certificate.

Traffic: 6RM-6ZBS, 43; 6RV, 8.

WOMING—The state of Wyoming is almost null and void of summer amateur radio. 7ZV has dismantled and moved to the west coast. 7AJT, the only active station at the present time, has been issued an O.R.S. certificate. 7LU, the A.D.M., has resigned and moved west. There will be no A.D.M. for Wyoming for the present. All reports to be mailed direct to the D.M.

Traffic: 7AJT, 2.

SOUTHEASTERN DIVISION
H. L. Reid, Mgr.

FLORIDA—There has been a slight change in the principal traffic stations this month, but these stations are so located that the routes remain the same. 4HZ leads Jacksonville with his 5-watter and is regularly in touch with Miami through 4NE. 4FS and 4EZ work both north and south with some regularity. 4IZ is in daily touch with Jax stations and this is our heaviest traffic route. 4XE-4IU is regularly QSO Jax from his new QRA in Winter Park, and much traffic is handled through schedules. 4QY is plugging steadily on and not complaining about summer WX. He has schedule with 5EZ, works 5AM regularly, and he and 4UA are QSO Cubs. 4NE is making a mark for himself down on the tip-end of the static country . 4CH gets out well.

VDM is heard regularly and QSA throughout Florida and our members are in receipt of some very nice letters from the Canadian Government.

Traffic: 4IZ, 4UA, 4IU, and 4II have good totals but figures garbled in telegram. 4HZ, 20; 4QY, 27; 4EZ, 9; 4FS, 8; 4PK, 8.

SOUTH CAROLINA—4DX, 4PV and 4IT were the most consistent stations this month, all being QSO eastern U. S. 4PV is the new D. S. of dist. No. 2. 4DX and 4IT have a daily schedule at 6 P. M. 4SH's "50" went west, leaving he and 4RR, who used it on Friday night, off the air. 4RR put in a 5 and had several consistent schedules until it followed the 50.

All South Carolina stations are looking for schedules during the month before 7 P. M. and don't be backward in asking us for them.

Traffic: 4PV, 48; 4DX, 334; 4SH, 20; 4IT, 52; 4RR, 42.

ALABAMA—Dist. No. 1: Activities in Anniston seem very promising for the coming season. 5GP has been doing good work. 5BP and 5WB expect to be back on the air by August first. City Manager Moore of Gadsden reports very little ham interest during the past month. 5QP is the only station working. 5VC and 5HM will probably be heard by fall.

C. M. Connolly reports almost nothing doing for Birmingham. The rebuilding habit is about to ruin the city. 5VV has been quiet due to sickness. 5AMH is still working on his new outfit. 5MI and 5AX have combined and promise to start work at an early date.

Dist. No. 2: D.S. Brooks reports no activity in his territory.

Dist. No. 4: D.S. Dunstan says nothing doing. 5XA is the main station in the district and has been closed during the summer months on account of school being out.

Traffic: 5GP, 75.

GEORGIA—Work has been hindered considerable this month due to lightning and wind damage to aerials and equipment. 4BI, 4EO, 40A and 4RH lost their towers and aerials. 4DT lost a plate transformer due to lightning striking the power line. 4SI, on the night of July 13 at about 1:00 A.M., C.S.T., reports hearing both ends of a conversation between Canadian 9AL and VDM.

No station in Savannah handled any traffic this month due to bad weather conditions and stations being out of commission. 4XX is continuing tests with NKF every other night at 9:00 P.M. Macon has had unusual static this month and coupled with this most of the operators have been out of town with the result that there was no traffic handled. 4BW is trying to get a daylight schedule going with Savannah. 4PL is rebuilding his set.

Please note the change in my address is 76 Clemont Drive. This also means that I will have to put up new aerial system which means quite a bit of work and being off the air for about a week.

Traffic: 4SI, 52; 4EQ, 43; 4IO, 26; 4EH, 5; 4RH, 6; 4AZ, 8.

WEST GULF DIVISION
F. M. Corlett, Mgr.

As evidence that summertime and summer weather is still with us, and that quiet hours have been with us (and still are 150-200 meters, don't forget that —D.M.) our activities for this month embrace only 47 stations reporting.

OKLAHOMA—The A.D.M. failed to report. However, from force of habit two stations reported direct and will be included this time. Hereafter, reports received direct will not be included in this report, each station now reports to his A.D.M. 5APG reports 16 and 5ANF 4, making a total of 20 for Oklahoma. Out New Mexico way 5LG-5SC likewise reported direct; received 15 sent 9, and mailed 3.

Now that we have short waves with no quiet hour restrictions, let's see if we can't make a better showing.

NORTHERN TEXAS—This months report is short and snappy. All operators are either on their vacations, have just come back, or are preparing to leave for same. Hi. Also their stations are under process of reconstruction for the coming winter DX season. The QRN is fierce and this is a good time to put the old junk pile into working order. Regardless of the above conditions, traffic has been moving through most parts of the section as will be noticed from the reports listed below. No new O.R.S. appointments have been issued this month.

Traffic: 5RG, 62; 5AQC, 6; 5AKN, 65; 5AAO, 7; 5AES, 24; 5CT, 55; 5LI, 17; 6NW, 81; 5ANA, 94; 5UD, 20; 5BD, 19; 5DW, 15; 5NY, 14; 5HY, 10; 5II, 13; 5ACQ, 30; 5AGH, 61; 5PH, 18; 5ADV, 27; 5KX, 5; 5QY, 52; 5FC, 19; 5ADH, 102; 5VU, 9; 5QT, 2; 5AJT, 9; 5UO, 75; 5XAJ, 61; 5NS, 66; 5DC, 12; 5OQ, 15; 5AJH, 46; 5AGQ, 20.

SOUTHERN TEXAS—There seems to be a decided summer slump. QRN is bad and those that are not rebuilding are on vacation. 5BO at Marathon and 5AKZ at Corpus Christi are doing good work and want schedules. 5MF at Bay City is a newcomer. 5ADX and 5GY represent the Rio Grande Valley. The San Benito Radio Club own their own club building. San Antonio is represented by 5EZ who is QSO 4QY, 5UX, QSO west 5AJZ, 5HC, 5HS, 5WP, 5ZAE-5GB, 5XAQ-5ACZ and 5VO. The latter is in reliable communication with Mexican BX. 5XAV is still busy at Texas U. 5ALR is away on vacation, leaving Austin to 5FT by his "lonesome." I wish to make another appeal to active station owners to let me have their reports. Don't force a D.S. to run you down and get ur report by force. There is lots of activity down here but don't make me guess what it is.

Traffic: 5BO, 6; 5EZ, 26; 5UX, 48; 5VO, 32; 5AEW, 5; 5ADI, 3; 5XAV, 2; 5XAQ, 35; 5ZAE, 2.

CANADIAN SECTION
A. H. K. Russell, Can. Gen. Mgr.

The past month saw the departure of the C.G.S. Arctic for the Arctic Circle, and with her departure Canadian amateur activity jumped up again to almost winter heights. During the first weeks of her trip communication by amateur radio was maintained direct to and from the vessel by amateur stations in the Ontario Quebec

and Maritime divisions, to such good effect that messages from the vessel were laid right on the desk of the Radio Superintendent. In the latter part of the month the signals from the Arctic have been disappointingly weak, and direct work with her has been very slight. The westerly shift of signals seems to have started for the last two stations to report VDM were in Northern Ontario and not in the east as would be expected. One of these two stations advises also that VDM's signals were copied on his 60 metre harmonic, which is perhaps a word to the wise.

In the Maritime Division 1AR has been particularly faithful in staying on the job, as has 1EF. The Montreal gang are all fine, with 2GG being the big noise. In Ontario 3AFP in Ottawa has proved a valuable inlet for Ottawa traffic, whereas in Toronto a regular nightly schedule with six stations listening for VDM is in force. The Western Divisions will no doubt shortly get their fling at VDM and they will certainly be ready, 4CR in Winnipeg being still strong in the East, and in BC 5CT is going after the laurels.

The C.G.M. had the pleasure of attending the Meeting of the Board of Directors in Hartford on July 25th. Several things of moment to Canadians were discussed, and in particular the proposal to have a meeting and Convention in the fall, at which all the Canadian Division managers would be present met with favour and an appropriation to assist in the payment of Division Managers expenses to the Convention was passed unanimously. At this convention it is hoped also to have the field man of the League, Mr. Hebert, and possibly the Traffic manager. There is a difference of opinion as to the most desirable location for the meeting, but if things work out properly it will likely be in Winnipeg.

But all is not so rosy as the above in Canada. The C.G.M. recently took a survey of the stations appointed for sending the weakly broadcast messages with the result that all appointments except three were cancelled. The following stations are broadcasting Saturday and Sunday nights at 10.30 local standard time the weekly message of information.

British Columbia	5GO
Alberta	4DQ
Saskatchewan	4HH
Manitoba	nil
Ontario	3GG
	3XN
Quebec	2CG
Maritimes	1DD

Now, fellows we need many more stations for this work, to cover the country. If you are really desirous of showing your pep, write in to your Division Manager and ask for an appointment.

MARITIME DIVISION
W. C. Borrett, Mgr.

Several changes have taken place in the Maritimes during the last month which will mean that the coming fall work will be placed on fewer stations. In Halifax two of our best stations will be no more. Harold Larnder of 1DT having gone into radio commercially in the British West Indies and Davidson of 9BL having finshed college and located in Quebec.

A Gang of Canadian Hams we hear regularly, with 9ASV second from the right sitting. The Canadians are, 3VH, 3LY, 3EY, 3OJ, 3UJ.

The gang generally are trying their best to hook up with VDM and WNP. Transatlantic work seems at a standstill, but most of the gang are expecting to hook up again with the British staions very soon provided that their government will allow them to work us. In New Brunswick a new station has appeared in 1BO at St. Andrews. He is u2CNA spending the summer in Canada. He is a first-class op and has made a fine addition to our N.B. district. 1EI has handled 9 msgs and has a nightly schedule with 1EF. 1AM (some call Hi.) (should qualify for a ROTAB,) and 1AN are QSO St. John and N.B. now has a good net-work of stations. 1AF and 1DN are reported going strong with 1AB. The D.M. wishes to make it known that if any O.R.S. fails to report this month, whether they have handled any traffic or not, their O.R.S. certificates will be cancelled. We must have these reports if we are to publish a true report of our activities in QST. Every station should make it his business to write to his A.D.M or D.M. of the 23rd of each month. Don't expect a few of us to do all the work.

In Prince Edward Island things seem to have gone to sleep for the summer. 1BZ and 9AK are still there, but are not heard very often.

In Novia Scotia 1AW sent in a fine report and it looks as if the Cape Breton end is beginning to show real signs of activity. 1AR has been on all

summer and has worked and reported VDM more than any of the gang. 1BQ has handled 5 msgs and his station is now dismantled for repairs for transatlantic work. 1BV is leading a dogs life. Hi. He is traveling the Provinces so cannot be counted upon for several months. 1DJ has been reported in Italy. 1EB is in the nil column for traffic. 1DD has handled only three msgs. 1AQ has located at new quarters and as soon as the R.I. gets through with him will be on. 1DF is another silent station. 1EF connected up with two new Maritime stations, 1AB and 1AM. For the "Steenth" time of asking, will all stations please report their activities this month without delay.

Traffic: 1EI, 9; 1BQ, 5; 1EF, 6; 1AR, 25; 1DD, 3.

ONTARIO DIVISION
C. H. Langford, Mgr.

Summer must be here at last because things are certainly slower than in other seasons. In general the interest in the air at present is VDM going up north. Ottawa has two fine stations in 3AF 100 watts, 130 meters and 3AFP on 135 meters. 3AFP has recently been appointed C.M. The only active station at Kingston is 3HE. 3MP has been appointed C.M. of Brockville. The Central division is well lined up with regards to working VDM. There is a station on the air every night ready for work with the Arctic. The star of the Division is 3BQ. Putting sigs into New Zealand is real FB. Stations between Kitchener and Windsor are working very irregularly. With the present shortage in operators it is with the greatest of pleasure that I announce the recent splicing of old 3GN, now 9AR of Sandwich, Ontario. Friend 3NI is back on the job after holidaying for a month. He is now located at 355 Duffrin St., Port Arthur, Ont.

Traffic: 3DS, 5; 3ADU, 10; 3WV, 14; 3ACO, 21; 3IA, 20; 3NI, 18; 9BW, 28; 3YV, 1; 3OH, 55; 9AL, 122; 3VH, 5; 3WG, 9; 3QO, 7; 3BLY, 20; 3OJ, 10; 3FC, 27; 3XN, 4.

More Canadian Hams
4HN, 4IO, 4DQ, 4GT, 4CW, 4AX, 4GC, 4AB, 4IC.

QUEBEC DIVISION
J. V. Argyle, Mgr.

2BE and 2CG are the only steady workers and will be found any night after 10:30 P. M. on their wave lengths of 132 and 127, respectively. Since complaints have been received that Quebec stations are not available for QSO with the U.S. due to insistance on short wave work only, it has been arranged that on alternate days after 11:30 P.M. at least one Quebec station will be transmitting on 150 meters **exactly.** 2BG is on occasionally as may be said of 2DO and 2CT. Communication with Nova Scotia, New Brunswick and Ontario remains perfect due to cooperation of friends 1BQ, 1AR, 1EI, 3FC, 9BC, 3GC, 3AMP, and 9AL. 3NI is our link with the far west. A new station 2CI is back on the map and gets us out of the "one city division" class. He is at 81 Therese, P.Q.

Traffic may be slight but the experience gained in using the 120 meter wave in mid-summer has been immense. Signals are as good as mid-winter from all our low wave neighbors, and work through QRN is easy.

VANCOUVER DIVISION
A. J. Ober, Mgr.

Amateur activity is 100% better this summer than last, and most stations report static 100% worse than last summer. The west coast has stations on each night. 5CN and 5GO are with us again, two ops. at 5GO who handle a lot of traffic. The Alberta gang have sure got the right idea, every transmitting amateur in the province was at a meeting held in Galgary for the purpose of a purely amateur's club, for active members only. Attendance was 100%.

VANCOUVER CITY—5GO takes the cake for traffic again. 5GF is a regular station and handles traffic. 5GG is kicking in fine style with a five watter, and has handled his share of traffic. 5CN is going full blast. 5CA says "ND," transformer trouble," 5HG and 5EF are often heard. 5AN and 5HP are new stations and doing RB, also 5HH with C.W. 5BJ is on occasionally. 5CW has worked 5GG and should be a useful station for traffic. He has worked 5GG.

Traffic: 5GO, 31; 5GG, 13; 5GF, 14; 5CN, 2.

ALBERTA DISTRICT—This district is sure a live one. Every station reports regularly. No matter how bad QRN is you will find at least one station working right through it. 4GT is the "go getter" for this month. He blew two 250 watters as fast as you could hand them to him, but this didn't stop him. 4IO gets pure D.C. with home made chokes, condensers, and motor-generators. 4CW is at the coast for a few weeks. 4AX has a counterpoise that can be mistaken for two clotheslines any time. It's a wonder he gets out at all—the location is enough to break any "hams" heart—50 watter going soon. 4IC is going over the week-ends during the summer. 4GC, one of the oldest amateurs in the west, whose call is not well known on the air, but whose experiments are. 4AB is still handling traffic when not trying to get soup out of a super. 4DQ is on each night and handling traffic through the second op. the O.W., working Mexican 5's and reports from the 3rd dist.

VANCOUVER ISLAND—5CT has trouble in raising anybody and in getting pure D.C. QRN very bad most nights. He is increasing power and remodelling. 5HK reports blowing tubes, bad QRN and no traffic.

EDMONTON—The new D.S. is Mr. Sacker of 4HF. His station was the only one on the air last month.

PRINCE RUPERT DISTRICT—The D.M. would like a line from all active stations here. What has become of 5CX and 9BP?

4JK uses a Baldwin phone in place of the reed on his large saxaphone, enablnig him to make the saxaphone play almost anything. Hi!

Calls Heard

When Preparing a List for QST, it is Essential to Observe the Following Rules:

1. List the calls neatly on a separate sheet of paper with a line of space between lines do not embody them in a letter.
2. Arrange the calls as they will appear in QST: across the page, numerically by districts, alphabetically in each district, Canadian and foreign calls listed separately, state whether spark or C.W., and give period of time covered by the list.
3. Forms close on the fifth of the month preceding the date of issue of QST. Make your lists cover the period from the first of one month to the first of the next if possible, but don't let your list come in late.
4. List only calls over 500 miles distant.

HEARD DURING JULY

unless otherwise specified

J. V. Newson, 139 Ormside St., London, S.E. 15 Eng.

1abc, 1acl, 1af, 1aja, 1ajp, 1aur, 1awn, 1ax, 1ba, 1ber, 1blb, 1bnt, 1boa, 1br, 1bre, 1beb, 1bv, 1cak, 1chl, 1cmp, 1cw, 1dj, 1dt, 1eb, 1fd, 1gk, 1jv, 1mo, 1xab, 1xah, 1xak, 1xam, 1xar, 1xmk, 1xu, 1xw, 2adk, 2agb, 2apu, 2ar, 2awg, 2bn, 2bnt, 2bvm, 2cg, 2er, 2ff, 2gk, 2ik (?), 2lr, 2rk, 2xa, 2xab, 3bar, 3bj, 3blu, 3bp, 3cd, 3cdn, 3mb, 3om, 3pl, 3pz, 3xar, 3xm, 3xo, 3yo, 4bel, 4mb, 4ot, 4vk, 4xc, 4xe, 4xr, 5akq, 5mi, 5us, 8ay, 8abf, 8bs, 8pl, 8xbp, 8xs, 9alb, 9br, 9xbh.

Can.: 1af, 1ar, 1bq, 1dd, 1dt, 1fr, 1sr, 2be, 2bg, 2da, 3bf, 3bq, 9bl.

S. K. Lewer, 6LJ, 32 Gascony Ave., West Hampstead, London N.W.6., England.
(June 16th—July 13th)

1abf, 1xap, 2wd.

Can.: 1ar, 1bq, 1dd, 1ef, 1ei, 2be, 9bl.

Argentine: CB8. Receiver; Det. one step A.F. All crds. QSL'd.

Carlos Lacombe, Brazil (during Pan-American Tests.)

1bc, 1bcg, (1bcr?), 1xam, 1xe, 1xw, 1xz, 6er (140), 8bpa (140), 8xm (140), 8xs, 9dq, 9zt, (190).

Can.: 1ar.

Argentine: caf, cb8 (120), 92 (135), tez (145), hcb (152), 8vo (122). Numbers in perenthesis indicate wavelengths.

Santangeli Mario, IER1 (5) S. Eufemia 19, Milano, Italy

Dutch: 0ab, 0ws, 0pc.
British: 2pj, 2dy, 5ms, 5rz, 6ny,
Finnish: 1na, 3nb.

Can. 5AY, River Jordan B.C. 25 Miles West of Race Rocks, Straits of Juan de Fuca

July 22, 23, 27, 28: 6abe, 6adm, 6any, 6awl, 6bon, 6brf, 6cfg, 6che, 6chl, 6cng, 6cte, 6ctt, 6hj, 6km, 6od, 6oh, 6pl, 6xbj, 7gy, 7mn, 9cfy, 9dgn, 9dug.

Can. 30H, Toronto, Ontario.

(4af), 4dv, (4dx), 4dy, 4er, 4fg, 4ft, 4hr, 4hz, 4jr, 4kj, 4kl, 4pk, 4pv, 4rr, (4si), 4sy, 4tj, 4xe, 4xx, (5aam), 5agn, 5ais, (aiy), 5aku, (5alz), (5amh) 5aoj, 5oat, (5apc), 6aps, 5ari, 5ck, 5cn, 5es, 5fm, 5fv spark, 5gp, 5in, 5ka, 5nj, 5nt, 5oq, 5ox, 5qh, 5uj, 5wi, 5wo, 5xaw, 6cgw, 6iv, (9aa), 9nau, 9anw, 9abk, 9acq, 9adc, 9aep, (9agl), (9amb), 9arp, 9atp, (9auw) 9auy, 9axk spark, (9axx), 9ayd, 9bcx, 9bdq, 9bew, (9bib), 9bjz, 9bkj, 9bkk, 9bnu, (9bru), (9bty), (9bvn), (9byf), (9caa), (9ccw), (9cdb), (9cdo), 9cee, 9cfi, (9cfs), 9cgr, (9che), 9cho, (9cii), (9cjs), 9cmf, (9co), (9csa), (9ctf), 9cwf, (9cxy), 9cyz, (9dct), 9dcw, 9dfq, (9dga, 9dlb, (9dlz), 9dmj, (9dno), 9dpx, (9drr), (9dsa), (9dwx), 9dyz, (9ebh), (9edh spark), (9egw), (9elb), (9eld), (9gp), (9gs), (9hw), (9kd), 9la, 9qw, (9vm), 9zg, (9zt).

Can.: 1ar, (1ef), (1ei), (3ni), 5go, (vdm).

C. P. Sweeney, ex-5KM. Wood's Hole, Massachusetts

1aeg, 1aac, 1xw, 1xu, 1xae, 2wz, 3dk, 3eu, 3le, 3vw, 3nbw, 3nuv, 3aoj, 3afp, 5apf, 8de, 8mc, 8rt, 8xa, 8bkh, 8bky, 9xbd, nfv, nkf.

Can.: 1ar, 1bq, 1dj, 1ef, 2be, 2cg, 3gg, 3gk, 3ni, vdm.

A. Vasseur, S.S. "Myriam" FZU.

Low Loss Tuner—1 step. QRN vy bad during all the trip.

June 21. 430 miles WSW Ouessant (France). All below 160 meters: English: 2dr, 2of, 2no, 2pc, 5dn, 5ik, 5ko, 5ma, 5mo, 5nw, 5pu, 5sl, 5ti, 5uv, 5xn. French: 8em. Dutch: onn.

June 22. 700 WSW Ouessant. All below 140 meters: English: 2lz, 2od, 5fs, 5nw, 5si. French: 8dp, 8zm, fl. Italian: 1ht.

June 23. 960 WSW Ouessant. All below 160 M.: American: 1ccz. Can.: 1bqy. French: fl.

June 25: Azores Islands, 1960 E. New York. All below 160 M.: American: 1abf, 1ajw, 1cmp, 1xax, 4ccl. Can.: 1eb, 3zl. French: fl.

June 26. 1700 E. N.Y. Most below 175: American: 1abf, 1aja, 1cak, 1ccz, 1rr, 1xax, 1zz, 2bgo, 2cla, 2wz, 3xn, 4za, 8amo, 8bqi, 8cnp, 8cwu, 8rj, 8vt, 9cil. French: fl.

June 28. 1450 E. N.Y. All below 160 M. and most with R8 to R9: American: 1abf, 1bie, 1bjo, 1cmk, 1cmp, 1gv, 1qr, 1zz, 4fs, 4pv, 4za, 9zt. Can.: 1ar, 1dj, 1eb, 1ef, 9ak. French: 8bf, fl. u9zt, clar and fl readable several feet from phones.

July 4. Carribbean sea, 150 S. Haiti. QRN vy bad. All below 175 M.: 1bie, 1zz, 3cjn, 3pl, 4af, 4dx, 8bnh. French: fl.

July 7. Port of Colon: fl (QSA but unreadable thru QRN). N.D. afterwards, conditions too bad.

Pse QSL to: A. VASSEUR, 53 rue de Chabrol, PARIS 10. All cards answered.

1ABA, 46 Summer St., Hyde Park, Mass.

4am, 4bj, 4dx, 4ft, 4it, 4jr, 4oe, 4tj, 4py, 5acs, 5ak, 5amm, 5wi, 7bc, 8aez, 8aip, 8ak, 8apt, 8apw, 8aq, 8atp, 8atz, 8avx, 8bad, 8bal, 8bd, 8bit, 8bgo, 8bhe, 8bk, 8bkm, 8blc, 8bo, 8bqk, 8bvr, 8bvv, 8bwb, 8cet, 8chp, 8cmu, 8cn, 8cnz, 8cud, 8dat, 8dgo, 8dhu, 8dkm, 8dm, 8do, 8fj, 8hn, 8kc, 8lr, 8mj, 8mp, 8no, 8rj, 8rw, 8si, 8xc, 8ym, 8zg, 8zs, 9anl, 9afy, 9ali, 9alr, 9amb, 9ami, 9asw, 9ato, 9ayx, 9bc, 9bcb, 9bdb, 9biw, 9bk, 9bta, 9bpy, 9bqu, 9cfx, 9cgy, 9cme, 9ep, 9cs, 9cuf, 9cze, 9dbm, 9ddm, 9djn, 9dcb, 9dct, 9dfr, 9dgg, 9dgx, 9djn, 9djz, 9dks, 9dlw, 9doe, 9dpx, 9dvt, 9dvw, 9ebh, 9elb, 9eld, 9eru, 9pq, 9re, 9tq, 9vc, 9xbg.

Can.: 3nv vdm.

J. A. Baker, 1BIS, Claremont, N. H.

4af, 4jr, 4qw, 5cn, 5xaw, 6cgw, 8aer, 8bma, 8bp, (8bpl), 8cbx, 8cud, 8dcs, 8dfm, 8die, 8dgv, 8dhu, 8fj, 8gp, 8hu, 8lr, 9aau, 9acq, 9arf, 9axx, 9baz, 9bbf, 9bie, 9cax, (9cee), 9cgr, 9chc, 9cip, 9cmf, 9ctf, 9ctm, 9cww, 9dcw, 9dlm, 9dpx, 9dqu, 9dww, 9eac, 9eht, 9eji, 9em, 9le, 9mc, 9xw, 9zt, nkf, wwv.

Can.: 1aw, 3gg, 3ni, 4bk, 9bw, vdm.

F. D. Merrill, Jr., 1PP, Northwood, N. H.

4cn, 4eq, 4ft, 4iz, 4pv, 4rr, 5aiy, 5akw, 5amh, 5apc, 5aqw, 5ka, 5ns, 5ux, 6cgw, 7co, 9aa, 9aal, 9aap, 9aic, 9amt, 9ato, 9awy, 9awg, 9ayo, 9bah,

9baz, 9bcb, 9bib, 9bk, 9bmu, 9brx, 9bty, 9bwf, 9ccm, 9cdb, 9cee, 9cfs, 9cgr, 9csa, 9csg, 9ctf, 9cxx, 9db, 9det, 9dja, 9djz, 9dma, 9dro, 9dsa, 9dvv, 9dxa, 9dyz, 9el, 9elb, 9eli, 9es, 9gp, 9pq, 9rc, 9tf, 9uc, 9xbd, nkf.

Spark: 5fv, 9bmk.

Can.: 1ar, 1bo, 1bq, 1dd, 1dj, 1eb, 1ef, 2be, 2cg, 2hv, 3gg, 3kq, 3ly, 3nf, 3oh, 9cd, vdm.

1AWE, Norman Miller, 25 Phillips Street, Providence, R. I.

4dv, 4dx, 4ea, 4fg, 4fs, 4ft, 4gu, 4hr, 4ii, 4it, 4jr, 4kl, 4pv, 4un, 4wb, 5aiy, 5amh, 5apc, 5aqw, 5ari, 5ck, 5gp, 5in, 5ka, 5nj, 5nt, 5ox, 5ua, 5ux, 5wi, 5xab, 6avj, 6awt, 6cgw, 9aa, 9aal, 9aja, 9amb, 9amr, 9anc, 9oas, 9arp, 9bcx, 9bhb, 9bhy, 9bkk, 9brx, 9bvn, 9bwb, 9bwr, 9ccw, 9cdo, 9cee, 9cfs, 9cpk, 9cze, 9db, 9dcw, 9dge, 9doe, 9eli, 9gp, 9kd, 9la.

Can.: 3gg 4fz, vdm.

2WZ, Brooklyn, N. Y.

(4af), 4ai, 4bx, 4dx, 4dy, 4ea, 4el, (4fs), (4ft), 4it, 4jk, 4jr, (4js), 4kl, 4pk, 4pv, 4rr, 4sy, 4tn, 4un, 4ut, 4xg, 5ad, (5bj), 5in, 5ns 5oq, 5pr, 5qk, 5uk, 5wo, 5aiy, 5akn, 5amh, 5apc, 5xaw, 6cgw, 6cqe, 9ck, 9gp, (9gs), 9hw, 9kd, 9mf, 9pq, 9ta, (9uc), (9zt), (9aau), 9abt, 9ado, 9afi, 9afz, 9alb, 9amb, (9auc), 9aud,9azx, (9baz), (9bcb), (9beb), 9bpd, (9bvn), (9bwf), 9bye, 9byj, 9caa, 9cco, (9ccw), 9cee, 9cfi, 9efk, 9cfs, 9cfv, (9cgr), (9cho), 9cip, 9ckr, 9cmr, 9csa, 9csg, (9ctf), (9cvf), (9cxx), 9cze, 9czl, 9dbm, 9det, 9dfz, 9dga, 9dhz, (9djz), 9dln, 9dma, 9dmj, 9dms, 9dpx, (9dqu), 9drc, 9dsa, (9dsl), 9dsz, 9dtk, 9dtt, 9dvw, 9ebh, (9efz), 9elb, (9eld), (9eli), 9xbb.

ICW: (1ck), 1kv, (1xu), (1aux), 1bbo, (1bpz), 8hd, (3gc), 3lg, 3zo, (3cdk), 5wo, (8ku), 8aer, 9arf, vdm, (nrg).

Spark: 1aeh, 4fg, 5fv.

Fone: (1alj), 4dx, 8brc.

Can.: (1ar), (1bo qra?), 1bq, 1dd, 1dj, 1eb, 1ef, (1ei), 1aar, 2be, 2cg, 2fo, 3bq, 3fc, 3gg, (3he), 3is, (3kg), 3kq, 3ly, 3ms, 3ni, (3oh), 3uj, (3vh), (3yh), 3ze, 3aec, 4cn, 4cr, 4hh, 5cp, 5gu, 9al, 9bc, 9he.

3BMN, R. J. Carr, 617 Union Ave., Petersburg, Va.

1fd, 1kv, 1mo, 1ow, 1uj, 1vk, 1xu, 1xw, 1yk, 1zz, 1abo, 1ael, 1asu, 1avx, (1bce), 1bef, 1bvb, 1cmp, 1cmx 4af, 4ai, (4dx), 4er, (4fs, (4ft, (4gw), 4hr, 4hu, (4it, (4iz, 4je, (4jr), 4js, 4lj, 4pv, (4qw), 4rr, (4tj), (4um), 4un, 5wi, (5aiy), 6cgw, 8aq, 8bp, 8ef, 8fm, 8gz, 8hb, (8jq), 8rj, 8rt, (8sp), 8uf, 8ut, 8vq, 8wt, (8wy), (8wz), 8ago, (8apt), 8atp, 8avl, 8axf, 8axn, 8ayw, (8bit), 8bkh, (8bkm), 8blp, 8bnh, 8boy, 8brc, 8bvr, 8bwb, 8byb, 8cdc, (8cei), 8cgf, 8ckm, 8cmh, (8con), 8cpk, 8cwp, 8cxa, 8dec, 8dks, 8dla, 8dmt, 8dnf, (8dsn), 9aic, 9alb, (9cco).

Fone: (3ahp), (4dk), (8bit), 8dmt.

Can.: 3dz, 3gg, (3oh), 3nf, 3wv.

3CEN, 411 West Main St., Annville, Pa.

4jr, (4kl), 4pv, 4um, 4tj, 5am, 5aik, 5amh, 5cn, 5gp, 5nj, 5wi, 9aal, 9ado, 9ako, 9aps, 9apy, 9baz, 9beb, 9bfx, 9bjz, 9bk, 9bqh, 9bwf, 9caa, 9cfk, 9chc 9cow, 9cze, d9oe, 9dfz, 9dge, 9djb, 9djn, 9dlj, 9dqu, 9dwx, 9eld, 9eli, 9kd, 9rl, 9vm, 9xbn, (9xx spk).

Can.: 1ef, 2bg, 2bj, 2cg, 3gg, 3ly, 3ni.

4FM, Miami, Fla.

1abf, 1aeg, 1ahf, 1ajp, 1ava, 1axl, 1bie, 1bvl, 1ccz, 1cmp, 1cmx, 1cpc, 1cpo, 1gh, 1gv, 1ka, 1mo, 1my, 1ow, 1pz, 1xae, 1xak, 1xu,2ana, 2bm, 2bmr, 2brb, 2cmk, 2cnk, 2ctq, 2cyq, 2eb, 2iu, 2kf, 2mj, 2mu, 2pd, 2wr, 2wz, 2xx 2xi, 3adf, 3aky, 3apv, 3auv 3bgt, 3bta, 3bva, 3bwt, 3cdk, 3cjn, 3xg, 3xw, 5ac, 5adv, 5aku, 5alz, 5amh, 5amw, 5apa, 5apc, 5av, 5in, 5nj, 5ua, 5uk, 5uy, 5ux, 5wi, 5xaw, 6cgw, (wking z4aq), 8aer, 8bit, 8bkh, 8bkm, 8bnh, 8bpa, 8brc, 8bt, 8cdc, 8cei, 8cnw, 8cdn, 8cyi, 8daa, 8dkh, 8dnf, 8dtc, 8dsn, 8ef, 8hn, 8sp, 8wy, 8xaq, 8xb, 8xs, 8xx, 9aau, 9alb, 9cee, 9cip, 9cmn, 9cxx, 9dlm, 9dqu, 9eld, 9hw, 9zg, 9zt.

Can.: 1ar,, 1bq, 1dj, 1ef, 2cg, 3mb.

Cuban: zww, 2by.

Foreign: poz 70 meters.

nkf, www.

Note: u2cyq and c2cg hrd on 2nd harmonics.

4PV, 148 Avant St., Spartanburg, S. C.

(1aap), 1abf, 1azr, 1bcu, 1bdx, (1bgq), 1boa, 1bq, 1bvr, 1bwj, (1cak), 1cmx, 1cpj, 1gv, (1mm), (1pl), 1py, (1rh), (1zd), (2abt), (2aey), 2al, 2ana, 2ayp, (2bgo), (2bmr), (2bqb), (2brb), 2cg, 2cjj, 2cka, (2cqz), (2crq), (2crw), 2cvj, 2cvu, 2cwj, 2gk, (2jc), (2kf), (2mo), 2my, 2rb, 2rk, 2wz, 2xbf, 5agn, 5aiy, (5alz), (5aom), 5ck, 5es, 5fm, 5gi, 5iq, 5kc, (5nj), 5pa, 5pk, 5ua, (5uk), 5vv, 6avj, (9aa), (9aal), 9aau, (9arp), 9aud, (9aus), (9auy), (9baz), 9bce, 9bcx, 9bdp, (9be), (9biw), 9bjz, 9bk, 9bkj, (9bkk), 9blr, 9bmk, (9btk), 9bwf, 9bwu, 9cah, 9cco, 9cfi, 9cfs, 9cii, 9emr, (9cwp), 9cyq, (9czb), 9cze, 9dfq, 9dge, (9dgv), 9djn, 9dlm, 9dlw, (9dmi), 9dmj, 9dpx, 9dsa, 9dtk, 9ead, (9ebq), 9efz, 9elb, 9eld, 9eli, 9em, 9kd, 9tf, 9uc, 9vc, 9xw.

Can.: 5mb.

M. Castro Fernandez, 4RL
A. E. Saldana, 4TL
5 Miramar Ave., Santurce, Porto Rico

1aeg, 1ajp, 1ben, 1bfz, 1bvb, 1ccz, 1cmx, 1gv, 1kv, 1pl, 1xax, 2act, 2cnk, 2kf, 2mz, 2xi, 3api, 3bco, 3bm, 3buy, 3cdc, 3cdn, 3chh, 3cjn, 3me, 3mo, 3vw, 4af, 4ft, 4iu, 4iz, 4pk, 4pt, 4pu, 4uq, 5cn, 5es, 5nj, 5ux, 8apw, 8bah, 8bzc, 8cdc, 8cec, 8cei, 8clc, 8cpk, 8cwu, 8sp, 8uf, 8xbp, 8xs, 8zg, 9aau, 9al, 9dlm, 9xw, 9zt.

Fone: 4ft, kdka, wgy.

Pse QSL if u hv hrd our 10 watter. Will do same.

5AQW, ex-5ANC, 223 So. 3rd St., Enid, Okla.

1aaw, 1aer, 1boa, 1fp, 1gv, 1xam, 2brb, 2cjn, 2mo, 3bwj, 3bco, (3cdk), 3he, 3jj, 4ai, 4bq, 4dp, 4fg, (4gw?), 4jk, 4jr, 4io, 4pk, 4pv, 4tf, 4tj, 4xe, (mni 5's), (6agk), 6alw, (6amw), 6apt, (6bcp), 6cgw, 6zcd, 7aby, 7afw, 7co, 7fd, 8aaj, 8abm, (8cun), (8cwp), (8cyi), 8ij, (8jq), 8jy, 8xt, 8yu, (nine too mni).

Can.: 3gg, (3ni).

Mex.: (bx?).

5AR, Bay Minette, Ala.

1bcu, 2big, 2ciq, 2rk, 3buy, (4af), (4jr), (5ap), (5in), 8agp, 8atp, 8bkf, 8bkh, 8bnh, 8bno, 8brc, 8bzc, 8dfw, 8dil, 8cci, 8zg (9aal), 9aau, (9acq), (9ado), 9ahz, 9aob, 9arr, 9auu, 9avz, 9awf, 9ay, (9ayx), 9bcb, (9bio), 9bk, 9bkk, 9big, 9bpr, 9brc, 9bss, 9bwf, 9ccl, 9ccw, 9cdo, 9cea, 9cee, 9cip, 9dcw, 9dey, 9dfq, 9dge, 9dhg, 9djn, 9dlm 9dmj, 9dno, 9dpx, 9dsa, 9dvp, 9dxs, 9ela, (9es), 9gg, 9lb, 9tob, 9xar, 9xl, 9zt.

nkf (100 meters).

5AJH, Abilene, Texas.

2xi, 3bi, 3dx (?), 4ai, (4bx), 4dx, (4fg), 4fs, (4kl), 6aja, (6ajh), 6avj, (6bcp), (6brf), 6cae), 6cch, 6cek, 6fm, (6cfe), (6cgo), 6chx, (6cms), (6cng), 6crw, 6cqe, (6cto), (6cua), (6cgw), 6en, (6gg) (6ih), 6lv, 6rb, (7ahs), 7ij (qra), (7it), 7no, 8brc, 8cwp, (8dhs), 8dtc, (8er), 8gz, 8xs, (9aau), 9acg, 9acq, (9ado), 9agl, (9alb), 9amb, 9oab, 9avn, (9ayd), (9ayx), 9bgx, (9bhc), (9bib), (9bio), 9bkk, 9bko, (9btn), 9bun, 9ccw, 9cdo, (9cee), (9cfi), 9cip, (9cld), (9dfq), 9dkv, (9dlm), 9dmj, 9dqh, (9dsa), (9eam), 9efu, (9eld), (9elp), (9pq), 9qw, 9rb, 9xw, 9zt.

Mexican: (bx), ik.

Radio 5GP, Anniston, Ala.

1abf, (1abs), 1ajp, 1emp, 1sf, 2bgi, 2gk, 2kf, (2rk icw), 2xab, 3abw, 3api, 3apv, 3bsb, 3bva, 3bvl, 3buy, 3bwt, (3cdk), 3hs, 3ke, 4af, (4du), (4dx cw & icw), (4dy), 4fq, (4fs), 4fu, 4iz, (4jd), (4jr), 4js, 4jz, (4pk), (4pv), (4rh), (4rr), (4si), 4um, 6apw, 6bcp, 6cgw, 6xv, 8aaj, 8abm, (8aer), 8ago, (8ayw), (8bit), 8bjg, (8bkh), 8bkm, 8bmb, 8bnh, (8agp), 8aip, 8ajn, 8amq, (8app), 8atp, (8axf), 8brc, 8brh, 8bvr, 8cdc, 8cei, 8ckm, 8cmh, 8cnl, 8con, 8cpk,. (8cwp), 8cwr, 8cyi, 8dbf, 8dgo, (8dhe), 8dhs, (8die), (8dnf), (8dsn), (8dtc), 8dc, 8ef, 8er, 8fj, 8gz, (8hn), 8jq, 8kh, 8rj, 8af, 8vq icw, 8vy, 8yx icw, 8zr, (9aal), 9ado, 9aey, 9agl, 9aic, 9aim, (9alb), 9amb, 9aor, 9arr, 9aud, (9aus), 9auy icw, (9ayb), 9ayo, 9ayx, (9bcb), 9bcx, 9beb, 9bed, 9bkf, 9bkk, 9bko, 9blg, (9bmk spk), 9bmu, 9bpn, (9bpt), 9bpy, 9brx, 9bsp, 9bty, 9bvn, 9bwf, 9cnn, 9cco, 9ccw, 9cdb, 9cej, 9cfi, 9cho, 9cii, 9cow, 9ctf, 9cuk, (9cvf), 9cvo, 9cxx, (9czq), 9dbm, (9dct), (9dcw), 9dhy, (9die), 9djn, 9djz, 9dkn, (9dlh), 9dlm, 9dlt, (9dng), 9dpx, 9dqu, (9dvg), 9dwx, 9dxn, 9dxr, 9dyz, 9ebh, 9ebq, (9ebv), 9efz, 9eld, 9eli, 9ell, 9elp, 9em, 9gs,

9kd, 9pq, 9tm, (9uc), (9vd), (9xbg), 9zt, ak-6, weak.
Short Waves: 3lg, 4dv, 5in, 5kc, 5ak, 5xaw, 5xbh, 8bpa, 8btl, 8cwp, 8vq, 8xaq, 8xbp, 8ato, 9eli, 9xbb, (9xbh), 9xbn, 9xl, 9xw, nkf, kdka.
Can.: 3bd, 3ni, 3oh, 3vh, 9bc.
Cuban: 2by.
Fone: 4fg, (4pk), (4si), 5amf, (8aer), (8cwp).
Dalite: (4dx), 4hz, (4jd), 4kl icw, (4si), 5agd, (5alz, 5apc, 5arb, 5ari, 5ac, (5cn), (5nj), 5sg, (5wi), 5wo, 9anu, 9bkj, 9cee.

5KC, Plaquemine, La.

(4dx), 4fs, 4kl, 5es, 5fm, 5in, 5ka, 5mo, 5nw, (5oq), 5qh, 5qk, 5ro, 5sk, 5vo, 5xv, 5aam, 5aem, 5agl 5aiy, 5ajh, 5amo, 5aom, 5xab, 6cgw, 8cy, 8fj, 8azh, 8dal, 9le, 9qw, 9xl, 9zt, 9acq, 9alb, 9amb, 9ayx, 9bkk, 9cew, 9cip, 9bcr, 9dou, 9dpx, 9dwx, 9eht.
Mexican: if, bx.

5ANE, W. Merkle, 804 Parkman Ave., Selma, Ala.

1ajp, 1bdx, 1gv, 2crq, 2kx, 2nz, 3now, 3bgt, 3bp, 3bua, 3buy, 3cdk, 3dg, 3er, 3kk, 3lg, 3mo, 3ms, 3nz, 3oh, 3ph, 3rg, 3ut, 4es, 4ft, 4ja, 5acq, 5aed, 5aef, 5agl, 5ail, 5ais, 5al, 5am, 5amk, 5amu, 5anv, 5ck, 5de, 5do, 5dw, 5es, 5fm, 5gr, 5ha, 5ii, 5iu, 5iz, 5ka, 5kn, 5la, 5ll, 5lt, 5om, 5pk, 5rc, 5sg, 5sh, 5sk, 5sw, 5ul, 5vk, 5vo, 8aap, 8aer, 8agp, 8ajn, 8apw, 8aux, 8ax, 8bh, 8bis, 8bit, 8bks, 8bll, 8bmb, 8bmt, 8bnb, 8bns, 8boc, 8brc, 8brm, 8bv, 8bvr, 8cei, 8cjg, 8clc, 8cmc, 8cpk, 8cy, 8dae, 8dd, 8de, 8dec, 8dem, 8dh, 8dhe, 8dhs, 8die, 8dt, 8fm, 8ik, 8io, 8kh, 8rj, 8sc, 8up, 8vq, 8vt, 8wn, 8zg, 8zz, 9aau, 9aaw, 9abx, 9acq, 9ada, 9aed, 9ako, 9no, 9nsh, 9nuc, 9nvn, 9awg, 9baz, 9bcx, 9be, 9bed, 9beu, 9bit, 9bk, 9bka, 9bkk, 9bkp, 9bpt, 9brp, 9ccs, 9cdo, 9cee, 9cfi, 9cfk, 9cnu, 9ctr, 9cvi, 9dbf, 9dcw, 9dge, 9dlu, 9dlw, 9dpx, 9drc, 9dro, 9dwx, 9dxn, 9eby, 9efu, 9eht, 9ela, 9elb, 9is, 9ld, 9pb, 9qr, 9rd, 9ss, 9um, 9vm.

5NW, Denton, Texas.

3lg, 3mo, 3oh, 4ai, 4dx, 4dv, 4eq, (4hz), 4kl, 4pv, 4si, 6amm, 6apw, 6awt, (6bfw), 6bcp, 6brf, 6cae, 6cgw, 6cqe, 6cto, 6ih, 6lv, 6ry, 7acm, 7no, 7wm, 8aal, 8brc, 8bvr, 8chp, 8con, 8cpk, 8cud, (8cva), 8cwp, 8doo 8sn, 8vy.
Can.: 3ni.
Mex.: bx.
All heard on one tube 1bgf tuner.

No lists received from sixth district stations this month. What's the matter fellows, too much summer static your way?

7AKK, Portland, Oregon.

(6abe), (6adb), (6adt), (6amf), (6amm), (6amo), (6bab)i(6bkb) (6bor) (6bqr), (6brf), (6bwl),(6cfe) (6cmm), (6hj), (6jp), (6mh), (6qm), (6ry), 8cee, 8er, 9ado, 9amb, 9bpt, 9cfi, 9cpm, 9cze, 9dpx, 9eam, 9eli, 9mc.
Can.: 4cq, 4er 4gt.
QRK my 10 watts? All cards ansd.

7AKN, St. Helens, Ore.

All over 750 miles: 5akn, 5nj, 5uy, 6brf, 6cbb, 6ge, 6gg, 6ja, 8xs, 9cf, 9cfi, 9cfy, 9cm, 9ea, 9eam.

8BFE, Williamsport, Pa.

4af, 4bk, 4bg, 4dx, 4fg, 4it, 4jr, 4kw, 4pv, 4tj, 5nam, 5aex, 5akw, 5apc, 5ck, 5gp, 5ka, 5uk, 5xat, 9abt, 9arp, 9amb, 9axx, 9bcx, 9bdb, 9be, 9bhb, 9bjf, 9bkj, 9bkk, 9bmk, 9bmu, 9bwf, 9bzb, 9cdo, 9ckf, 9cp, 9del, 9dpx, 9dfx, 9dfz, 9dix, 9dwx, 9dns, 9dxs, 9ebh, 9efs, 9my, 9nu, 9vm, 9zt, nfv, fctn qra?
Can.: 1ar, 1dd, 9al.
German: poz.
French: uft.

8BKM, Conneaut, Ohio.

(1aac), (1abf), (1aeg), (1ail), 1alj, 1ano, 1apc, 1arf, 1axu, 1bcc, 1bgq, (1bip), 1bkq, 1bdy, 1bvl, (1bzc), 1ccz, (1ci), 1cjm, (1ckd), 1epc, 1etw (1dq), (1gv), (1py), (1rh), 1xae, 1xw, 2aef, (2apy), 2asy, 2wz), 2xbf 3ach (3add) (3adv) 3afs 3aoj 3be (3bmn) (3bno) (3ybu) (3bva, 3bvu), (3cdk), 3oe, (3wf), 3xx (2ws), 2xbf, 3ach, (3add), 3afs, 3aoj, 3be, (3bmn), (3bno), (3buy), (3bva), (3vdk), 3oe, (3wf), 8xx, (4af), 4ai, 4aid, 4er, 4da, 4dv, (4dx), 4fg, 4ft, 4it, 4kl, 4pk, 4pv, (4si), 4tj, 4un, 4xz, 5acl, 5aik, (5aiy), 5ajh, 5akw, 5alz, (5amh), 5anv, 5aom, 5ap, 5apc, 5cn, 5fm, 5gp, 5in, (5ka), 5ns, 5nw, 5oq, 5ph, 5qh, 5zd, 5sg, 5ux, 5vu, 5xbh, 6cgw, 6lv, 7ij, (9aa), 9aau, 9ado, (9agl), 9aic, (9alb), 9apy, 9aqd, 9atp, 9aud, 9auw, 9ayj, (9ayx), 9bnz, 9bc, 9bcb, 9bcx, 9beb, 9bhb, 9bib, 9bio, 9bjb, 9bkj, 9bkk, (9blg), 9bmv, 9bwf, 9bvn, (9ccj), 9ccw, 9cee, 9cfi, (9cfs), (9cgr), 9chc, (9cho), 9cip, (9cpo), (9ctd), 9cud, 9cvh, 9cwp (9cze) 9czl (9czq) 9dbw, 9dct, 9dfq 9dhy, 9dix, 9djz, 9dma, 9dmj, 9doe, (9dpx), 9dqu, 9dqw. 9dyz, (9ebh), (9eji), (9eld), 9elp, 9hw, (9kd), 9ki, 9ny, (9oa), (9pq), (9xbb), 9xl, 9zt, whu, wnp, vdm.
Can.: 1ar, 1bq, 1ef, 2be, (2cg), 4cr, 9bc.

8CYI, Crown Service Station, 306 Clay Ave., Rochester, N. Y.

(4ag), (4ba), (4dv, (4er), (4fs), (4kl), (4li), (4on), (4pv), (4sh), (5aat (5agv), (5aiy), (5alo), (5aom), (5apc), (5aqw), (5ka), (5ns), (5nw), (5ph), (5qy), (5ut), (5xau), (6abk), 6agk, (6ahp), 6ak, (6amw), (6apw), 6avr, 6bau, (6bbc), (6bbw), 6bcp, 6bez, 6bnt, (6bql), 6buo, 6bur, (6gt), (6cgw), 6cka, 6ckr, 6cmr, 6cog, 6ddj, 6cef, 6ep, 6es, 6it, 6lv, 6zar, (6zp), 6xe, 6xn, 7abb, (7bj), (7gb), (7gq), 7gf, 7ip, (7ks), 7zw.
Can.: (1er), (1bv), (1bq), (1eb), (4fx), (4hh).

8DCF, 31 Kingsville Ave., Ashtabula, Ohio.

1aab, 1ajp, 1bns, 1mp, 1xu, 1zz, 2bgi, 2bxw, 2cgh, 2cgr, 2cka, 2cvj, 2cyq, 2eb, 2mo, 2wz, 3acf, 3ach, 3aht, 3bdi, 3bgg, 3bkq, 3bsb, 3bta, 3bwt, 3ec, 3ko, 3ll, 3oo, 3af, 3ah, 3ue, 3uu, 3uy, 3zo, 4af, 4dx, 4ft, 4hr, 4lj, 5es, 5ka, 9aps, 9aud, 9eld, nkf.
Can.: 3ad, 3dz, (3ia), 3iz, 3ms, 3ni, 3wv, 3zb, 9al.

8RY, Sullivan, Ohio.

1ci, 1ka, 1my, 1qr, 1abs, 1afc, 1alj, 1any, 1oas, 1are, 1art, 1aur, 1axa, 1aww, 1bdx, 1bes, 1bie, 1bjq, 1blb, 1boa, 1bvr, 1bvv, 1bwj, 1bzp, 1cmx, 1ccz, 1cjm, 4dv, 4eq, 4fg, 4ft, 4js, 4lj, 4si, 4ay, 4tj, 4jr, 5ka, 5gp, 5in, 5qh, 5ua, 5uk, 5wi, 5wk, 5aiu, 5ajh, 5amh, 5apc, 6lv, 6bel, 6cgw.
Specials: 1xu, 1xae, 1xak, 1xay, 2xab, 2xi, 3zm, 4xi, 4xz, 5xab, 5xaw, 5zas, 8xaq, 8xbp, 9xbd, ak5, nkf, whu.
Can.: 1ar, 1bq, 1ef, 2be, 2cg, 9al, 9bg, vdm.
Wud like QRN on stn "BM" hrd using "de" intermediate. QTC anybody?

9AFR and 9AN, Lincoln, Nebr.

1abf, 2rb, 2rk, 4eq, 4fg, (4pk), 5ak, 5ck, 5es, (5fm), 5fv (spk?), 5ge, 5gf, 5gp, 5in, (5ka), 5lm, 5oq, 5ox, 5pk, (5qh), 5rg, 5sk, 5sg, 5uk, 5ux, 5ano, 5acq, 5adm, 5aen, (5aew), 5aex, 5ail, 5aiy, 5ajh, (5akd), 5akv, 5amh, 5anl, (5apc), 5apx, 5aqw, 5xaw, 5za, 5zas, 6ih, 6lv, 6aja, 6avj, 6cqe, 7td, 8hn, 8jq, 8rb, 8avx, 8azh, 8bhe, 8bit, 8bma, 8bmb, 8bmt, 8bns, 8boe, 8bvu, 8cab, 8cei, 8cjp, 8cts, 8cva, (8cwc), 8cwu, 8dae, 8dec, 9dmx, wyf.
Can.: (3ad), 3oh.

9EAN, Clarence Roser, Potosi, Wis.

5amu, 5ck, 5pa, 8brc, 8cmu, 8dra, 8ela, 9bny, 9ckd, 9djn, 9dk, 9dno, 9ekx.
A card from the above would be appreciated.

9BCC, Valley Mills, Indiana.

1abf, 1aeg, 1ajg, 1aur, 1ahl, 1asy, 1axa, 1bbe, 1bbo, 1bdx, 1bie, 1bfl, 1bgq, 1bnt, 1boa, 1bzp, 1ccz, 1cre, 1gh, 1gv, 1pl, 1ow, 1vk, 1zd, 2ate, 2abt, 2azy, 2baw, 2boo, 2bgo, 2byc, 2bqg, 2cbx or 2cbk, 2cdp, 2cei, 2cgr, 2chz, 2cqz, 2cua, 2cwj, 2cvj, 2cyq, 2iu, 2kf, 2pc, 2ws, 3aoj, 3api, 3nuu, 3auv, 3bgt, 3bmn, 3bva, 3buy, 3cbx, 3cdk, 3cdn, 3cgs, 3fs, 3mo, 3na, 3oh, 3tp, 3vw, 3zo, 3zd, 4dx, 4fg, 4hr, 4hz, 4jr, 4kk, 4pv, 4rr, 4si, 4tj, kdef, kftu.
Can.: 1ef, 1bq, 1na, 2cg, 2do, 3ad, 9ae, 9aec, 9al, 9av, 3bq, 3gg, 3he, 3fc, 3jh, 3lw, 3nf, 3oh, 3oj, 3ni, vdm.

W. James, Covington, Kentucky.

1abf, 1ajg, 1aww, 1bdx, 1bvb, 1bwj, 1bzp, 1ci, 1cmp, 1cmx, 1da, 1pl, 1py, 1um, 1xak, 1xu, 2act 2bgi, 2bgo, 2bmr, 2bye, 2cjj, 2cla, 2ev, 2je, 2kx, 2rb (fone), 2ws, 2xi, 3aoj, 3apt, 3bm, 3cdk, 3fr, 3lg, 3ph, 3af, 3tf, 4hz, 5akn, 5nj, 5sg, 5ua, 5uk, 8amq, 8bzk 8uf, 8xas, 9bdq, 9bib, 9ckj, 9emf, 9dlm, 9dms, 9dqm.
Can.: 2cg, 3ad, 3bi, 3he, 3kq, 3oh.

Radio Communications by the Amateurs

The Publishers of QST assume no responsibility for statements made herein by correspondents

A Good Lightning Switch Mounting

227-229 South 5th St.,
Minneapolis, Minn.

Editor, QST:

I am arranging for a lightning switch here at 9ZT-9XAX which may be of interest. I have secured a piece of plate glass to fit in one of my window panes. I expect to drill three holes in this glass and mount the switch on the inside. The bolts going through the lightning switch will be on the outside where the lugs going to the antenna and ground will be secured.

This makes a very effective lightning switch which will be five inches from any portion of the building. In addition, a perfect lead-in has been made. For the sum of $2.00, the price of a sheet of plate glass, I have a perfect lead-in bushing and a perfect mounting for my lightning switch, together with ease of operation, inasmuch as the switch may be thrown without going outside. This will be very handy in the winter months.

Bert Wick just wrote me he had an idea of mounting lightning switches, and you will doubtless hear from him soon.

—*D. C. Wallace, 9ZT-9XAX.*

Metering Constants

816 E. Nodaway,
Clarinda, Iowa.

Editor *QST:*

In the July issue of *QST* I saw a formula for figuring the A.C. input to a transmitter. Being in the metering end of the electrical industry, I might add a few things to the information on pages XIV and XV of the July *QST*.

The following are the different disc constants, K, on the various meters of general use in homes:

Westinghouse		5-amp. 100-v. K=1/3
Westinghouse		5-amp. 220 v. K=2/3
Gen. Electric	(1-14	5-amp. 110 v. K=.3
Gen. Electric	(1-14)	5-amp. 200 v. K=.6
Gen. Electric	(1-10)	5-amp. 100 v. K=.25
Gen. Electric	(1-10)	5 amp. 200 v. K=.3
Gen. Electric	(1)	5-amp. 100 v. K=.3
Gen. Electric	(1)	5 amp. 200 v. K=.6
Duncan	(M-2)	5 amp. 100 v. K=.25
Duncan	(M-2)	5 amp. 200 v. K=.5
Sangamo	(H)	5 amp. 100 v. K=5/24
Sangamo	(H)	5 amp. 200 v. K=5/12

In the case of a larger current for the same voltage the constant varies directly with the current. For example, the Westinghouse 5-ampere 100-volt meter has a constant of 1/3; the 10-ampere 100-volt meter a constant of 2/3; and the 20-ampere 100-volt meter a constant of 1 1/3. This rule holds good on all of the above meters except the G.E. type I which has a peculiar constant which runs as follows; The 5-ampere 100-volt meter has a constant of .3; the 10-ampere 100-volt meter a constant of .6; the 15-ampere 100-volt meter a constant of 1.25; and the 25-ampere 100-volt meter a constant of 1.5. However, the average house meter seldom is rated at over 10-amperes so there is no use of having the constant for the larger meters.

Trusting this will be of some benefit to the gang in general and if any further information is needed I will be glad to do what I can to help. Will be on the air again soon with my old 5-watter (24.5 watts input. Hi!) and hope to do some real DX.

—*E. M. Ward, 9ADI.*

A Tip on the Meissner Circuit

Shawnee, Ohio.

Dear Eddy:

Have been experimenting with the loose coupled Meissner circuit as described in the first article of October, 1923, *QST*. It is sure FB. Here is something that will help out a great deal. Connect an 11 plate variable condenser with a capacity of 250 micromicrofarads (.00025) across the grid coil. At my station this raised the antenna current from .2 to .5 amperes. The taps on the grid coil as described in *QST* will not do this. With this arrangement the antenna current stays the same over a 50 meter band.

—*W. K. Francis, 8PL.*

A la Solodyne

620 Fern St.,
New Orleans, La.

Editor *QST:*

You may be interested to know that my "low-loss" *QST* tuner when using two 201-A tubes, (detector and one step) will oscillate with no separate B battery and give excellent C.W. signals on the low wavelengths from 35 to 125 meters. NKF and KDKA come in fine. Evidently the

drop across the filament rheostat is furnishing the plate voltage and the tickler coil makes the plate circuit almost resonant on those waves. The amplifier operates with no B battery also but gives signals a little weaker than when 48 volts is used. Also there are absolutely no audio noises and the set is as silent as a grave when the antenna is disconnected. It is excellent for the very low waves and weak signals are easily readable. Since doing away with the separate B battery I have copied a large number of amateurs on their harmonics.

—F. C. Moore, 5AD.

About "Low-Loss" Coils

52 Vanderbilt Ave.,
New York City,
New York.

Editor *QST:*

I have been very much interested in the articles in *QST* concerning low loss circuits, particularly so, perhaps, because I disagree with some of the things I have seen.

Some of the first spider-web coils that I have ever seen in this country were those used on an English trench transmitter which was reproduced by the Western Electric Company.

We made some tests on the radio frequency resistance of the coils and found them to be very much higher than the resistance of single layer solonoids of the same inductance.

Some of the sets you have illustrated in *QST* have solonoids wound in a sort of basket-weave form held together with string, I believe. This type of winding was used originally at the Western Electric Company but, even tho it may have had the effect of reducing a distributed capacity, the resistance at radio frequencies was too high and the idea was rejected.

As a matter of fact, for short wave reception I do not understand how it can be considered advantageous to space the turns, as is done in a spider-web or basket-weave coil when doing that calls for a larger amount of wire for the same inductance than when the coil is wound as a plain cylinder. Unfortunately, radio frequency resistance measurements, accurate enough to be of real quantative value, are difficult to make and expensive to set up. This may account for some of the misconceptions as to resistance and the real importance of distributed capacity.

A short time ago I described in RADIO & MODEL ENGINEERING what I believe to be the most efficient type of inductance for short wave reception. The Eastern Coil Company has made up special winding rigs for this type of coil so that they can be turned out for quantity production. The accompanying photograph shows the design employed.

The original windings, which we called "pickle bottle coils", were wound on octagonal pickle bottles. At every other flat, a strip of gummed paper tape was put on, gummed side up, and the wire wound over the tape. The glue was wet as the winding proceeded. When the full number of turns have been put on, each protruding end of the tape was folded over and stuck

down on the outside of the coil. When an additional winding for a primary was required, a second coil was put on the first, held also with the paper tape. After the coil was completed, the bottle was broken out, leaving a self supporting coil with no dielectric losses other than the negligible amount introduced by the paper.

One method of mounting the unit is shown. It is clamped between two strips of insulating material which serve as a support and also carry the primary and secondary terminals.

Manufacturers of low loss variable condensers admit that there is not much advantage in the use of a low loss condenser over the old types when windings of high resistance are employed. In fact, there is a far larger loss in the ordinary coil than in most cheaply-made condensers. This accounts for the frequent report that no improvement can be recognized in the operation of a circuit when a low loss condenser is employed for tuning.

There are numerous variations which can be made in the pickle bottle coils. I have recently made up a unit for a regenerative receiver similar to that described on page 47 of *QST* for July, 1924. I used a bottle 3 ins. in diameter, winding the secondary with No. 20 D.C.C. wire. The antenna coil is put directly over the secondary at one end and the tickler at the other end.

I think that experimenters who use the pickle bottle coils, if they have means for making any accurate tests, will find that there is sufficient advantage in the use of this design over any of the others that there will be an actual improvement in the operation of the set which can be recognized in the telephones.

—Milton B. Sleeper,

Ham Rambles

4547 Greenview Ave.,
Chicago, Illinois.

Editor *QST:*

Mr. Green, of 5VM, says in "Communications" of July *QST* that the "old spark days" were not so good, giving as proof the fact that we pull in and transmit to nearly every part of the globe nowadays. It is true that up-to-date methods are more effective, but why is it that men get more pleasure catching trout with a hook than with a fifty-foot net? It is the same with radio. If the old timer, with his collection of antiques, landed two stations in five hours, he felt better than the follow who now, with his super—whatnot, rakes in a young call book of his own every night.

One of the first stations I ever saw was that of Holst, 9BG, at Chicago. The occasion was a meeting of the Ravenswood Radio Association. Under my pop-eyed gaze was a set which I later learned, filled the basement with thunder, the hams with admiration, the power company with wrath, and the neighbors with devout religion.

Old 9ZN is another station that will remain in my memory forever. As the ether wave flew, I lived about one thousand feet from that station, and honestly, I was forced to hook a thiry ampere fuse in series with my one hundred foot aerial, to keep my set from going up in smoke. During their transmission, I would throw my three foot ground switch, and amble off in their direction. I amused myself by drawing sparks ½ inch long from the window screens on the window of the shack. Once in a while I got a peep at Matthews or one of the fellows smoking and pounding the key with a great air of indifference, which I secretly coveted. By this time a crowd would begin to gather. More sparks, this time for the public's benefit. Soon the racket from the interior of the hut would attract some man who was braver than the rest, or one who had led a Christian life and who knew that no matter how rashly he acted, an almighty power would protect him, opened the door and walked in, followed respectfully by the other most foolhardy three. I usually managed to get in, disguised as somebody's dog. In fearful whispers they made dumb remarks about the beloved rock-crusher. But there was always something sad about the man who knew nothing, but bluffed his way along to make an impression on his beloved thus;

"No, Eunice, that is not an X-ray machine, that is a tel'-e graphy' station. The man is sending dots and dashes. Each dot means something to the man at the other end of the wire (but nothing to you, you mutt.) That thing is the —er, sparker. That spiral thing is, well it has electricity in it; anything curled up like that has something to do with electricity."

And so forth, far into the night. When the shack became so crowded as to force the ones around the edge to sit on the "coffin," the operator on watch would put on his hat and coat, shut off the power, yawn, clear out the crowd, go out and walk around the block, only to come back later and start operations all over again. Later, when the traffic became heavier, they found they could keep out the crowd by simply locking the door. This, of course,shut off the air supply too, but the open spark gap formed enough ozone to keep the inmates alive. It was a common occurrence, so I was told, for the operator to press the key a half a hundred times, just to keep himself from choking to death.

—*Ray Hutchins, ex-9GL.*

These DX Hounds

1014 11th Ave., East.,
Duluth, Minn.

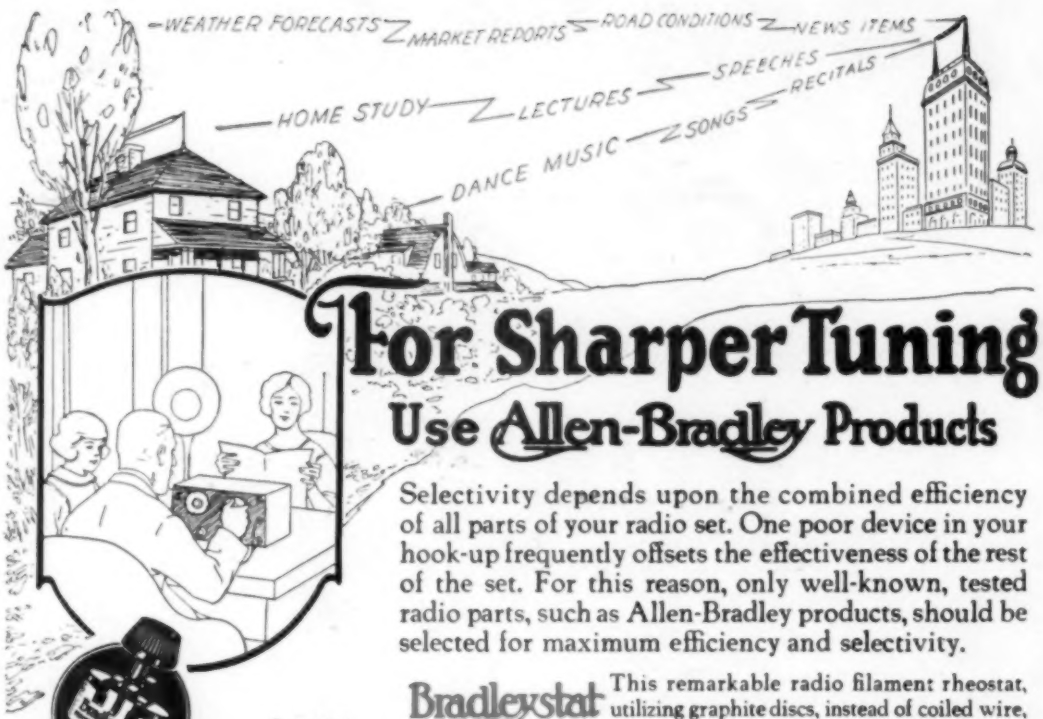
Editor, *QST*:

If there is anything that gets yours truly's goat it is to hear all the fellows in my district yell, "We can't get traffic through. The other fellow only wants to handle it with some one out in Hades or some other far off place." Say, how in the name of all that is good is a fellow going to get a respectable message total out of his district if this sort of thing is going on outside of his territory?

Here is a sample of what strolls in. 9EEP out in western Minnesota writes that he raises a station out in North Dakota and tries to pass some traffic going west to him, and all he can get out of him is "nil nil handling DX stuff now." This same bird that comes back with this kind of an answer is doing nothing but calling CQ CQ CQ CQ so many times that one wonders if he is trying to raise the Albatrosses off of the rocks of Terra del Fuego or what. No wonder the air is so polluted that at times a fellow has to go out and spray perfume into the ether to keep it smelling good.

Say, fellows, when you use your set why don't you use it with discretion. Treat it like you would your best girl. You don't go over in front of her house and yell at the top of your voice, "Oh, Mary, come on out; I want to take you to the movie.' You know how far you would get with such a stunt as that. You would get the business end of a brick and also that would be the last you would see of Mary. When you call CQ, do it as a gentleman should. CQ three times, de, then your own call; or, if you don't like that way of doing it, arrange schedules with certain stations and then stick to the schedules. This method can be likened to calling up the little girl on the phone and making the date privately. Also, for the love of Mike handle traffic if it comes only ten miles to get to your station. Not so much thrill, 'tis true, but it counts up at the end of each month, just the same.

—*James Hayes,*
Dist. Supt. for Northern Minn.



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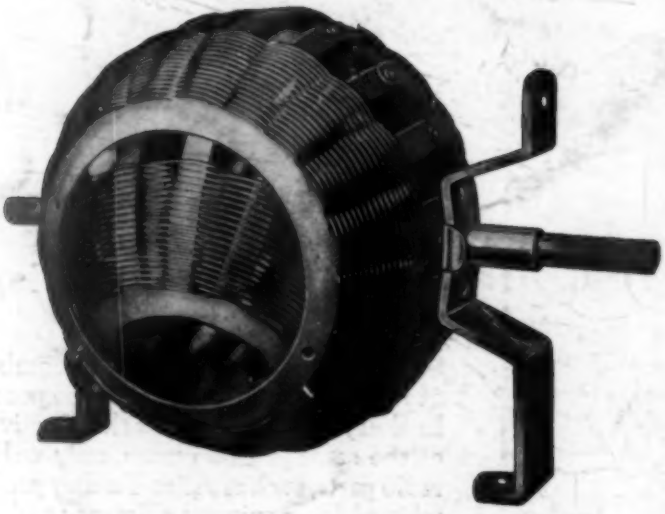

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